IDF 2009

20TH WORLD DIABETES CONGRESS

MONTRÉAL

18 - 22 OCTOBER 2009

ABSTRACT BOOK

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Abstract Book

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SYMPOSIUM

CLINICAL RESEARCH

What is obesity and why?

0001

Appetite regulation (acute)

D. Richard[1]
[1] *Institut universitaire de cardiologie et de pneumologie de Québec, Médecine, Quebec, Canada*

The escalating prevalence of obesity together with the rising awareness of the detrimental impact of this condition on health and health costs have considerably stimulated research related to the etiology of excess fat deposition. Regulation of fat mass (hence body weight) is determined by controls exerted on both food intake and energy expenditure. The brain is critically involved in those complex controls, which are achieved through the harmonized crosstalk between autonomic (hypothalamus and brainstem) and cognitive/limbic (hippocampus, amygdala, striatum, and cortex) brain circuitries. The control of food intake and energy expenditure, is insured by interconnected neurons expressing varied receptor types and producing diverse peptides or classic neurotransmitters that have been grouped into "anabolic" and "catabolic" mediators. Those mediators are found in nuclei such as the arcuate nucleus of the hypothalamus, paraventricular hypothalamic nucleus, lateral hypothalamus, nucleus of the tractus solitarius, nucleus accumbens, ventral tegmental area, amygdala and cortex. The "autonomic" and "cognitive/limbic" brains work inseparably in regulating energy balance as most of their nuclei are tied to each other to form pathways that control the intake as well as the expenditure of energy. They comprise neurons that produce energy-balance-influencing mediators such as neuropeptide Y, agouti-related peptide, alpha-melanocyte-stimulating hormone, cocaine- and amphetamine-regulated transcript, melanin-concentrating hormone, orexins, endocannabinoids, opioids, dopamine and serotonin. The production of these diverse molecules is modulated by short- and long-term signals that inform the brain about the status of the energy stores and energy fluxes. Whereas leptin and insulin are recognized as the main long-term tonic signals, the gastrointestinal hormones ghrelin, peptide tyrosine-tyrosine, cholecystokinin, and glucagon-like peptide 1 are known as short-term or episodic regulatory signals. Circulating nutrients, including glucose, lipids and amino acids, are also sensed by brain "catabolic" and "anabolic" neurons. The understanding of the complex controls exerted on food intake and energy expenditure appears essential to decipher the etiology of obesity and to envision proficient behavioral or pharmacological strategies to prevent or reverse excess fat deposition.

No conflict of interest

0002

Regulation of energy expenditure

B. Wisse[1]
[1] *University of Washington School of Medicine, Division of Metabolism Endocrinology and Nutrition, Seattle, USA*

Energy homeostasis is defined by the relationship between energy intake and energy expenditure. The last ten years have dramatically increased our understanding of the peripheral and central signals that regulate energy homeostasis – and animal studies have been essential for much of this progress. However, in some ways, firm conclusions related to the regulation of energy expenditure, have been harder to substantiate than those related to energy intake. Given the proliferation of mutant mouse models with body weight or body fat phenotypes – it is surprising that very few of these models demonstrate significant differences in energy expenditure. Part of the challenge lies in the technology and methodology. 'Between mouse' variance in calorimetry studies tends to be high relative to the expected 'between group' variance in energy expenditure needed to account for phenotypic differences. Part of the challenge lies in interpretation – and even now the best method to normalize oxygen consumption to body size or body composition remains disputed making it difficult to determine whether an obese mouse is truly hypometabolic or a lean mouse truly hypermetabolic. Nonetheless, progress has been made in identifying the central pathways that control energy expenditure and identifying the physiological signaling pathways and their impairment in pathological conditions. More importantly, studies in humans and rodents continue to suggest that energy expenditure – and specifically non-resting energy expenditure – may be a regulated variable that could be modified by pharmacological interventions.

No conflict of interest

0003

Central vs peripheral regulation of metabolism

T. Lam[1]
[1] *University of Toronto, Physiology and Medicine, Toronto, Canada*

Recent work has cast a spotlight on the brain as a nutrient-sensing organ that regulates the body's metabolic processes. In this lecture, I will discuss the physiological and molecular mechanisms of brain lipid sensing and compare these mechanisms to liver lipid sensing. A direct comparison between the lipid-sensing mechanisms in the brain and liver reveals similar biochemical/molecular but opposing physiological mechanisms in operation. We propose that an imbalance between the lipid-sensing mechanisms in the brain vs. liver may contribute to obesity-associated type 2 diabetes.

Conflict of interest:
Paid lecturing: Merck Co & Inc.

0004

The role of the adipocyte

F. Giorgino[1]
[1] *University of Bari School of Medicine, Department of Emergency and Organ Transplantation, Bari, Italy*

With excess energy storage, obesity develops, leading to increased risk for type 2 diabetes and cardiovascular disease. The current epidemic of obesity has caused a surge of interest in the study of the mechanisms regulating adipose tissue formation. It has been observed that adipose tissue contains a pool of adult stem cells with multipotent properties, which provide for the physiological cell turnover, and can be isolated and potentially utilized for tissue engineering and regenerative medical applications. These "stromal" cells exhibit pre-adipocyte characteristics, can be isolated from adipose tissue of adult subjects, propagated in vitro, and induced to differentiate into adipocytes. Different populations of multipotent precursor cells can be isolated from human fat fragments. Thus, adipose precursor cells are a heterogeneous cell population, consisting of fibroblast-like multipotential stem cells generally termed adipose-derived stem cells (ASCs). The basic biology of ASCs may provide important implications for the understanding of metabolic diseases in humans. The distribution of body fat appears to be also a major determinant of the metabolic and cardiovascular impact of obesity, even more important than the total amount of fat. Abdominal and, in particular, visceral adiposity is strongly linked to insulin resistance, type 2 diabetes, hypertension, dyslipidaemia, sleep apnea, and other complications of obesity. Visceral adiposity, manifested as a high waist circumference, is now accepted as a major component of the metabolic syndrome. However, the biological mechanisms underlying the adverse impact of visceral fat accumulation remain to be established. It is possible that even precursor cells may possess specific biological features according to their fat depot location, and that visceral fat precursors may be already committed to become more dysfunctional under conditions of excess nutrient intake.

No conflict of interest

NAMED LECTURE

EDUCATION

IDF SACA Bernard Houssay Memorial Lecture

0005

The discovery of insulin: history, science and controversy

A. de Leiva[1]
[1] *Universitat Autonoma de Barcelona, Medicina, Barcelona, Spain*

The discovery of insulin was a multi-step process shared by many investigators. On 1906, Georg Zuelzer (Berlin) injected subcutaneously his pancreatic extract to dogs and men, reporting beneficial effects on the excretion of sugar, and

ketone bodies ***(1).*** In 1912 the US Patent, ***acomatol,*** was licensed.
Nicolae C. Paulesco (Bucharest) published in the ***Traité de Physiologie Médicale*** (1920) (2), July 23, 1921 issue of ***Comptes Rendus de la Societé de Biologie (París) (3***), and ***Archives Internationales de Physiologie*** (August, 1921) ***(4)***, that he succeeded in obtaining an active extract from dog and beef pancreas, effective in lowering blood glucose in both pancreatectomized and normal dogs. The product also exhibited antiketogenic properties. On April 1922, the patent ***pancreíne*** was registered.
Frederick G Banting and Charles H Best, working at JJR Macleod's lab (Toronto) first tried the duct ligation to induce atrophy of the exocrine pancreas; later, they developed active extracts from fetal and adult ox pancreas, without the need of duct ligation. They published the leading article on animal research in the ***Journal of Laboratory and Clinical Medicine*** (February 1922) ***(5).***
The collaboration of J B Collip allowed the purification of the extract. On January 23, 1922, the first successful administration of the new extract to a diabetic subject occurred. The antidiabetogenic substance was named ***iletin*** first, and later ***insulin.***The first succesful clinical trial was published in the ***Canadian Medical Association Journal*** in March 1922 ***(6).*** In December 1922, the Collip/Best patent application included both the process and the product.

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5. Banting FG and Best CH. The Internal Secretion of Pancreas. Journal of Laboratory and Clinical Medicine, 1922;VII(8):256-271.
6. Banting FG, Best CH, Collip JB, Campbell WR, and Fletcher AA. Pancreatic Extracts in the Treatment of Diabetes mellitus. Preliminary report. Canadian Medical Association Journal, 1922;2:141-146.

No conflict of interest

TEACHING LECTURE

How does culture impact on diabetes education?

0006

How does culture impact on diabetes education?

M. McGill[1]
[1] *Royal Prince Alfred Hospital, Diabetes Centre, Camperdown, Australia*

Much of the predicted global explosion in diabetes prevalence will occur in developing countries. Paying for essential diabetes medicines, transport to hospital and the doctor's fee can render the person and family to abject poverty. Compounding the situation are limited access to learning self care behaviours and the influence of myths and culture on the cornerstones of diabetes management; medications, food and physical activity. In some instances, families lose everything on the "promise" of a cure. For the past 9 years the IDF Consultative Section on Diabetes Education has had a very strong focus on upskilling health professionals to increase access to evidence-based diabetes management whilst at the same time appreciating the important influence of culture on behaviour. Education strategies include the development of i) International Standards for Diabetes Education that enable diabetes services to benchmark their work practices against evidence; ii) educational tools such as the International Curriculum for Health Professionals and CD modular package of over 800 powerpoint slides and lesson notes, translated into the world's common languages and iii) multidisciplinary health professional workshops. In addition, the Section has implemented an IDF Recognition Program for institutions conducting their own education courses. A further exciting development and to build capacity worldwide, is the designation of Centres of Education in local institutions experienced in providing education. The institutions will form a global, collaborative voluntary network to initiate, facilitate, conduct and coordinate high-quality education for healthcare professionals. The successful Institutions will be announced during this presentation. World Diabetes Day celebrated on November 14th reached an estimated audience of a billion people in 2008 and the theme for the next 5 years is Education and Prevention offering further opportunities to improve outcomes. Only through this multifaceted approach will the lives of people with diabetes be improved no matter where they live.

Conflict of interest:
Advisory board: GSK Global Partnership

SYMPOSIUM

HEALTHCARE AND EPIDEMIOLOGY

Redefining diabetes? what tools? what is it anyway?

0007

HbA1c variability: fact and fancy

D.B. Sacks[1]
[1] *Brigham and Women's Hospital and Harvard Medical School, Pathology, Boston, USA*

Detection of increased glucose concentrations has been used to identify individuals with diabetes mellitus for over 3,500 years. Measurement of glucose in the blood, the most widely used test to diagnose diabetes, is limited by several factors. These include the need for the subject to be fasting, large biological variability and a lack of reproducibility of glucose tolerance tests. Glycated hemoglobin (Hb), most commonly measured as HbA1c, has an integral role in the management of patients with diabetes. Large prospective clinical studies have clearly documented that HbA1c is both an indicator of long-term glycemic control and predicts risk for the development of microvascular complications. These attributes, combined with low intra-individual variability and the lack of influence of food ingestion (a fasting sample is not necessary), make HbA1c appealing for the diagnosis of diabetes. The recent adoption of HbA1c for diagnosis increases the need for further understanding the reliability of HbA1c results. Conditions that change erythrocyte lifespan (e.g. hemolytic anemia, certain hemoglobin variants and blood transfusion) alter HbA1c. Race and age are also reported to influence HbA1c. Published reports indicate that some diabetic individuals have HbA1c values that are lower or higher than expected based on their clinical presentation and blood glucose results. This has led to a theory of high and low glycators whereby individuals with the same mean blood glucose have different HbA1c concentrations. Factors that influence the rate of glycation of hemoglobin and the implications for interpretation of HbA1c results will be discussed.

Conflict of interest:
Paid lecturing: David B. Sacks, Bio-Rad

0008

Hyperglycaemic states - what is the need when redefining diabetes?

K. Borch-Johnsen[1]
[1] *Steno Diabetes Center, Gentofte, Denmark*

Rationale: Diabetes is a condition characterized by elevated glycaemic levels in combination with an increased risk of developing diabetes specific, microvascular complications as well as macrovascular complications. The diagnostic procedure for diabetes involves fasting alone or in combination with post-challenge glucose measures. Currently the introduction of HbA1c as a diagnostic test is also being proposed. For neither of these three possibilities is it possible to identify a clear cut-point below which the risk is nil, and above which the risk is constantly increased. Glucose behaves as all other biological markers of risk. The risk increases gradually with the level of the risk factor in question. This raises two questions:
Is diabetes a specific disease, or is glucose "just" a risk factor in line with blood pressure, cholesterol etc?
and
If diabetes is a specific disease, what is the the most appropriate measure of glycaemia identifying those at risk
Methods: Based on pooling of large data sets from major parts of the world as done in the DECODE-study, the DECODA-study and the DETECT-2 initiative, the prognostic impact of each measure of glycaemia has been evaluated.
Results: Fasting plasma glucose, post-challenge glucose and HbA1c identify different individuals as "high risk" individuals, but with respect to risk of

developing microvascular complications they perform equally well. In relation to mortality and mortality from CVD, HbA1c and post-challenge are stronger predictors than fasting plasma glucose.
Conclusion: Based on the results of the large scale studies, the possibility of redefining the diagnostic criteria will be discussed, and the rationale for maintaining diabetes as a diagnostic entity will be reviewed.

Conflict of interest:
Paid lecturing: Knut Borch-Johnsen for Sanofi Aventis
Stock ownership: Knut Borch-Johnsen: Novo Nordisk A/S
Employee: Knut Borch-Johnsen, Director of Steno Diabetes Center. The hospital is owned by Novo Nordisk, but is an integral part of the national health care service in Denmark

0009

Redefining diabetes: a role for ß-cell function/mass ?

P. Butler[1]
[1] *Larry Hillblom Islet Research Center, Medicine, Los Angeles, USA*

Type 1 and 2 diabetes are characterized by hyperglycemia as a consequence of insufficient insulin secretion (impaired insulin secretion) to maintain glycemic control. People with type 1 and type 2 diabetes have relative insulin resistance compared to BMI matched non-diabetic controls. In contrast most people with obesity (and insulin resistance) do not develop diabetes, but adaptively increase insulin secretion.
The contribution of regulation and dysregulation of beta cell mass in pathophysiology of type 1 and 2 diabetes will be explored. Mechanisms that distinguish successful versus failed regulation of beta cell mass will be considered. The potential links between impaired beta cell function/mass and insulin resistance in type 1 and 2 will be considered.

No conflict of interest

0010

Redefining diabetes: insulin resistance and metabolic syndrome

N. Sattar[1]
[1] *University of Glasgow, Cardiovascular and Medical Sciences Faculty of Medicine, Glasgow, United Kingdom*

The metabolic syndrome has received considerable focus in the last several years as a means to pick up individuals at risk for diabetes and cardiovascular disease (CVD). Yet, whilst metabolic syndrome is associated with both outcomes, it is clearly more closely aligned to diabetes risk and does not enhance risk prediction for CVD. We recently showed that the criteria are not clinically beneficial for predicting risk of either condition and that separate risk algorithms are needed (1). This view is now increasingly accepted and metabolic syndrome criteria are likely to have a limited role in research but not in clinical practice. As regards insulin resistance, all agree this is a strong risk factor for type 2 diabetes but that its direct measurement is complicated and not amenable to widespread clinical use. However, we know now that simple clinical predictors, both non-lab and lab measures (reflecting upstream and downstream correlates of insulin resistance) can determine diabetes risk with good sensitivity and specificity. This talk will show how such predictors and recent algorithms (being regional specific) have genuine potential for widespread clinical use. The talk will also outline how such algorithms could be dovetailed efficiently with vascular screening programmes and thus be more widely used.
(1) Preiss D & Sattar N. Metabolic syndrome: collapsing under its own weight? Diabetic Medicine, 26, 457–459

No conflict of interest

SYMPOSIUM

CLINICAL RESEARCH

The renin angiotensin system in diabetes: from islet to kidney

0011

The new biology of the renin-angiotensin sytem

E.L. Schiffrin[1]
[1] *Sir Mortimer B. Davis - Jewish General Hospital McGill University, Medicine, Montreal, Canada*

The renin-angiotensin system (RAS) has been around since the discovery of renin (1898) and later angiotensin (1937). The RAS was until recently believed to be a linear system: renin generates angiotensin (Ang) I by acting on angiotensinogen, and Ang converting enzyme (ACE) generates Ang II from Ang I. Ang II was considered the final mediator of the RAS acting via Ang receptors. However, other enzymes, peptides and receptors have been discovered, such as AT1 and AT2 receptors which mediate effects of Ang II, ACE 2 as a pathway for conversion of Ang II to Ang1-7 (vasodilator and vasculo-protective which may act via the mas receptor), neutral endopeptidase as another potential generator of Ang1-7, Ang III and Ang IV (which may stimulate PAI-1) with their own putative receptors, all of which has changed our understanding of how the RAS maintains BP and body fluid homeostasis. The different components of the RAS have been detected in many tissues, suggesting local generation of Ang II, although renin appears still to come only from the kidney. Aldosterone, whose secretion by the adrenal glomerulosa is stimulated by Ang II, binds to mineralocorticoid receptors in many tissues and exerts effects in interaction with the actions mediated by Ang II via AT1 receptors. A receptor for renin/prorenin has been demonstrated, which increases tissue generation of Ang by renin and prorenin (the latter was thought to produce little or no Ang). Via these renin/prorenin receptors, renin and prorenin also produce Ang-independent effects via stimulation of MAP kinases. Accordingly, our knowledge of how to target the RAS to improve outcomes in humans with cardiovascular disease has increased significantly.

Conflict of interest:
Paid lecturing: Boehringer-Ingelheim, Bristol Myers-Squibb, Merck-Frosst, Novartis
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0012

The role of the RAS in diabetic nephropathy

P. Groop[1]
[1] *Folkhalsan Research Center/Biomedicum Helsinki, Department of Diabetes Genetics, Helsinki, Finland*

The development and progression of diabetic kidney diseases is the major preventable predictor of morbidity and mortality in individuals with diabetes. Although we have many tools, effective blockade of the RAS appears to be the most powerful. A number of clinical studies have confirmed the efficacy of RAS blockade in kidney disease in both type 1 and type 2 diabetes. However, these actions are only partially effective, and despite conventional blockade many individuals go on to end stage kidney disease. Although dual or triple blockade offer some improvement, there remains a significant unmet need. New understanding of the RAS and its interactions with other pathogenetic pathways will facilitate the development of new and potentially more effective approaches for renoprotection. In addition, recent strategies to optimise blockade and target feedback via renin inhibition and declining ACE2 activity may further enhance our chances of preventing renal damage in diabetes.

No conflict of interest

0013

RAAS in CVD

E. Lonn[1]
[1] *Hamilton Health Sciences McMaster University, Department of Medicine, Hamilton, Canada*

Cardiovascular disease (CVD) is the leading cause of mortality and a major source of morbidity in people with type 2 diabetes.
The RAAS is involved in the pathophysiology of CVD from hypertension to atherosclerosis, left ventricular (LV) hypertrophy, endothelial dysfunction, LV remodelling following myocardial infarction, congestive heart failure and endstage cardiac disease. The major mediator of vascular and cardiac abnormalities associated with activation of the RAAS is Angiotensin II, shown to increase oxidation, promote inflammation and endothelial dysfunction and to be involved in tissue remodelling and plaque rupture. A variety of the cellular receptors and mediators, in addition to the AT1 receptor and Angiotensin II are important in RAAS activation.
Pharmacological blockade of the RAAS can be achieved with beta-blockers, angiotensin converting enzyme inhibitors (ACE-Is), angiotensin receptor blockers (ARBs), and direct renin inhibitors (DRI). These drugs lower blood pressure and additionally reduce LV hypertrophy, improve endothelial function, retard progression of atherosclerosis and reduce inflammation. Large randomized controlled trials have shown improved outcomes in heart failure patients treated with ACE-Is and ARBs as single agents and combined. Trials in patients with stable chronic vascular disease have also shown improved outcomes in patients treated with ACE-Is. These benefits extended to people with and without diabetes. More recently, the ONTARGET trial demonstrated similar benefits for ARBs. In this patient population, combined ACE-I and ARB therapy did not confer additional benefits. Therefore, combined ACE-I and ARB therapy is currently not recommended in patients with chronic stable vascular disease and without LV dysfunction and/or heart failure. More recently, DRIs have been shown to effectively reduce blood pressure, proteinuria, LV mass in patients with LV hypertrophy, and BNP in patients with heart failure. Ongoing large trials are evaluating effects of DRIs on clinical endpoints.

No conflict of interest

0014

RAS and the beta cell

P. Leung[1]
[1] *The Chinese University of Hong Kong, Department of Physiology Faculty of Medicine, Hong Kong, China*

Type 2 diabetes mellitus (T2DM) is attributable to more than 90% of diabetes cases globally. It imposes huge demands on the healthcare resources in Western societies and is also now becoming a burden in developing countries such as China. Meanwhile, recent clinical studies have reported that pharmacological blockade of the renin-angiotensin system (RAS) reduces the incidence rate of new onset of T2DM. However, the exact mechanism(s) by which RAS blockade is protective against T2DM have yet to be elucidated. In this context, we have recently identified the existence of a local RAS in the pancreas which becomes upregulated in animal models of T2DM, hyperglycemia and islet transplantation. Locally produced angiotensin II modulates pancreatic islet blood flow, oxygen tension, (pro)insulin biosynthesis and oxidative stress. We also found that inhibition of this pancreatic islet RAS improves islet beta-cell structure, function and glucose tolerance as well as reducing pro-inflammatory factor gene expression and protein production in experimental T2DM. These experimental data suggest a partial regulatory mechanism for the protective effects of RAS antagonism, including those for T2DM, in humans. These findings provide a novel and alternative explanation for the reduced incidence of T2DM observed in large-scale clinical trials applying RAS blockers to individuals at high risk for this disease.

No conflict of interest

SYMPOSIUM

ASSOCIATION DEVELOPMENT

Association development in the context of IDF

0015

Has IDF helped associations in improving diabetes care ?

D. Franco[1], *G. Camara*[2]
The IDF represents the interests of a great number of people with diabetes and those at risk. Their mission is to promote diabetes care, prevention and a cure worldwide. The Federation has been leading the global diabetes community since 1950. In order to discuss from the point of view of an IDF member association we will talk about this relationship and if diabetes care in this association is improving because of that.
In 1999 a Brazilian diabetes association, ADJ joined IDF. From the beginning the association received informative materials about diabetes in the world and we were encouraged to inform about our work at the association. Since then the IDF has given opportunity to get more information on diabetes care and how to improve their knowledge in the treatment and inform laypeople how to fight for their rights.
In 2008 a partnership between ADJ, Brazilian Diabetes Society and IDF was created and an education program was settled and is now being replicated all over the country. Some results of this program will be presented.
A survey about the IDF and Diabetes Associations was done and some of this data will also be presented.

No conflict of interest

0016

Challenges facing diabetes associations in the real world

E. Morrison[1]
[1] *Diabetes Association of Jamaica, 1 Downer Ave, Kingston 5, Jamaica*

In the real developing world, irrespective of the high ideals outlined in vision and mission statements, persons with diabetes (PWDs) come to associations expecting help, not mere education only; but rather help to access consultations with experts and acquire medications at reduced cost. Associations which fail to deliver on these two, remain aloof and irrelevant.
The 33 years of my experience at the Diabetes Association of Jamaica, has taught me the key role of the peer and lay groups in sustaining and ensuring that the association keeps its focus on the PWDs. Any training afforded a consultant or officer of the association, must be translated and shared with educators and facilitators for the benefit of the PWDs.
A major challenge is funding. Efforts at fund-raising can be frustrating in many small settings especially found in developing countries. Here also, due to economic challenges, governmental support is not forthcoming. Further, pharmaceutical companies assist in very limited ways because of the perceived small market. In addition, these companies put any little support behind doctors, as it is this group that writes the prescriptions from which come the sales. Hence, there is very little resources financially to mount meaningful assistance programmes.
Human resource varies, and too often, the volunteer becomes a cost, whether by way of honoraria, out of pocket expenses etc. Commitment here is directly related to the closeness of diabetes to the volunteer, and even so, in the face of very little support, the interest fades.
It behoves the IDF, to work through its regions to look into these areas of potential fall-out amongst its membership and to use whatever networking possible to shore up these fledgling associations; ensuring their proper organisation and management structure which will best put them on track for self-sufficiency and sustainability.

No conflict of interest

0017

Are the relations between associations and IDF clear enough?

R. Zivkovic[1]
[1] *Diabetes Association of Serbia, President, Belgrade, Serbia*

Why, at all, may anybody ask such a question? What is the meaning, in this case, of the word ***clear?*** Does ***clear*** mean obvious? Or, does it mean something

like, relations are so clear that we have managed, performing IDF instructions and methods to lessen incidence of diabetes? Or, saying: relations are not clear, which side to look at the matter counts - IDF or National Association (NA) side? Does opinion of relevant Authority on national level count as well?
Do more initiatives, documents and instructions from IDF side necessarily mean relations become clearer? Does this ***clearness*** turn into ***turbidity*** if information on the other side is not captured properly within given time. Is the internal structure of the NA capable of coping with this increased number/volume of information provided in highly specialized language and form? If NA were not capable, would the decreased volume of information solve the problem?
Existing activities and relations are identified and assessed. Aiming at care, prevention and finding a cure for diabetes, IDF has made grandiose efforts setting up serious structure which made IDF bodies, functions and communications closer to the base. General Assembly and Congress, cooperation with CE, EASD, ISPAD, EURADIA, project like IMAGE, SWEAT, DIADVISOR, make just a part of IDF functioning.
IDF-Europe, has introduced a post, Association Development Officer. Hence, single NA left without real-time information/interface to any of the above.
To considered relations clear, IDF should simplify forms, procedures, language - NA should raise its internal structure to a level necessary to capture, recognize, process and implement information provided by IDF

No conflict of interest

0018

Taking diabetes care to the people: the experience from Puerto Rico

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The Asociación Puertorriqueña de Diabetes was founded in 1988 as a non profit organization with the mission to promote prevention and control of diabetes, as well as to educate patients, their families and the general community. Puerto Rico is a small island in the Caribbean with a population of almost 4 million people and an estimated diabetes prevalence of 12.8%. Therefore, education becomes an important tool to control diabetes and prevent life-threatening complications, especially within underserved communities.
The organization has developed a wide array of educational programs and services that are offered free of cost to the community, which main purpose is to empower the patient to take control of diabetes.
Some of the programs are: ***Health Train: Bringing Health to Every Stop***, education offered at schools; ***Train of Trainers: Educating the Educator***, workshop for school personnel; ***Your Health and Diabetes***, a weekly radio program; ***Nutritional Counseling***; ***Glucose Screenings***; ***Educational Material*** is developed and distributed; ***Internet Diabetes Library***, computers available for students and people without access to internet; ***Diabetes Conferences, Seminars and Workshops; Internet website***; ***EXPO Diabetes,*** the only convention dedicated to diabetes; ***Encaminada*** held during November, diabetes' national month, with an awareness walk; ***Adult Summer Camp "Step by Step: Take Control of Diabetes"***, a four day workshop; ***Public Service Announcements*** are developed to be transmitted in the media.
These efforts have been possible with the support of the community, private and government sector and by fund-raising events. The funds are invested in all the educational services. Also, the organization has created a network with other non profit organizations related to diabetes such as Renal Council of PR, Pediatric Diabetes Foundation, Puerto Rican Society of Endocrinologists, among others. This has provided us with the opportunity to exchange ideas, services and discuss issues that affect the people we serve.

No conflict of interest

SYMPOSIUM

FOUNDATION SCIENCE

Where now for diabetes genetics?

0019

Type 2 diabetes: whole genome analysis and beyond

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Until recently, progress in identification of the genetic variants influencing predisposition to common forms of diabetes has been slow. However, recent advances in genetics, genomics and informatics have enabled well-powered association scans designed to detect association signals across the entire genome.
For type 2 diabetes (T2D), the genome-wide association (GWA) studies so far performed have extended the number of loci harbouring common variants implicated in susceptibility to 20. Amongst the novel loci identified by this process include variants in/around genes which encode beta-cell zinc transporters (***SLC30A8***) and putative regulators of beta-cell mass (***CDKN2A/B*** and ***CDKAL1***). One of these new-found loci, mapping to the fat mass and diabetes associated (***FTO***) gene, influences individual risk of T2D through a primary effect on fat mass, making this the first common variant known to influence weight and individual risk of obesity.
Analogous efforts applied to continuous glycaemic traits have demonstrated the key role of variants in the melatonin 1B receptor gene in the regulation of insulin secretion: a large number of additional loci are currently being confirmed by large-scale replication. There is evidence that these variants have divergent effects on the regulation of fasting glucose in healthy individuals and on predisposition to T2D in later life.
There are three major challenges going forward. First, we need to understand the mechanisms whereby the associated variants at these signals impact on phenotypic variation and disease risk: this will require careful blending of genetic and genomic approaches. Second, we need to translate the biological insights generated into improvements in clinical care. Third, recognising that the variants so-far identified explain only a small proportion of overall susceptibility to these conditions (<10 percent), we need to develop and implement approaches that enumerate the unexplained variance.

No conflict of interest

0020

Type 1 diabetes: whole genome analysis and beyond

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Background: the CDCV paradigm. High-density genotyping arrays have enabled the examination of most of the common human genetic variation in large population samples. The results so far permit a reliable estimate of the contribution of common alleles (frequency > 0.01 the) to the $lambda_s$ (sibling relative risk, the most meaningful measure of familial clustering). These alleles, conforming to the common-disease-common-variant model (CDCV) typically confer weak relative risks (<1.5) and, collectively, explain a small part of the $lambda_s$. With larger and larger samples, more loci of smaller and smaller effects will undoubtedly be discovered, their potential total number being in the hundreds, or even thousands.
The future: Rare, highly penetrant variants and personalized medicine. Of the large number of such weaker genetic effects, it is likely that a considerable portion is weak only because of allele rarity. Among those rare alleles, some could have extremely high penetrance. Each of these variants will explain a large portion of the individual risk but only for a small fraction of the patient population, indicating that what appears to be a homogeneous phenotype may have distinct molecular aetiologies, responding differently to a given therapeutic intervention. For type 1 diabetes, we have started with copy-number variations (CNVs) both because they are prime candidates for biological effects and relatively easy to detect. Analysis of fluorescence signals from the ***Illumina*** Infinium array in 1,000 cases and 4,000 controls with the PennCNV algorithm, detected 11 CNV loci with significantly higher frequency in cases than in controls and large odds ratios (>>2). Collectively, these involve 6% of all cases. Confirmation with direct methods is in progress.

If confirmed, this will be a first step towards personalizing diagnosis at the molecular level, a step necessary for the meaningful evaluation of novel (as well as existing) therapeutics.

No conflict of interest

0021

The future of monogenic diabetes: from research backwater to clinical mainstream

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The key component of monogenic diabetes is that a mutation in a single gene results in diabetes. This means that genetic testing can be used as a specific and sensitive diagnostic test for the particular genetic subtype of diabetes. These subtypes, in contrast to type 2 diabetes, have a common and uniform aetiology resulting in considerable clinical homogeneity. This means it is possible to use the mutation as a predictor of future clinical course and also in unaffected subjects to predict whether they are likely to develop diabetes. Critically it has also been shown that for the commonest forms of Maturity Onset Diabetes of the Young (MODY) and Neonatal diabetes that treatment response differs between genetic subtypes. This means that the diagnosis has important implications for clinical care.
The major genes for monogenic diabetes have been diagnosed between 1992 and 2006 and have rapidly moved into being used as a diagnostic service in many countries throughout the world (see www.diabetesgenes.org). The cost and simplicity of genetic testing is improving rapidly and this will continue such that testing will become a relatively cheap and simple process which will mean that it will not be reserved for those with a high probability of having monogenic diabetes but used universally in children and young adults with diabetes. Given the considerable financial advantage in not prescribing insulin where it is inappropriate (estimated at $60,000 over a lifetime) then the financial implications of performing genetic testing may make it appropriate. However the performing of tests in patients with a low prior probability of having monogenic diabetes will lead to a whole new series of issues which will be discussed.

No conflict of interest

0022

Pharmacogenetics of diabetes: will we be able to predict response in the clinic?

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In diabetes, pharmacogenetics is a few years behind traditional case-control or quantitative trait genetics, largely due to the lack of large discovery and replication cohorts. Pharmacogenetics is complementary to these other genetic methods, and offers great potential. There are a few examples from the study of monogenic diabetes (HNF1A, KCNJ11, ABCC8) where identifying the genetic aetiology will guide therapeutic choice. However, in polygenic diabetes there are still no consistently replicated variants that influence response to the common oral agents, so we are a long way short of being able to utilise genetics in patients with type 2 diabetes. However, beyond the distant potential of pharmacogenetics to be used to determine treatment choice for patients with type 2 diabetes, it can be used as an alternative tool to unravel diabetes aetiology, to study biological pathways and to determine drug mechanism. Preliminary data from genome wide association studies (Affymetrix 6) will be presented to highlight this. A variant associated with sulphonylurea response, involved in insulin exocytosis, is also associated with type 2 diabetes risk; two variants in the metformin scan reveal novel mechanisms of metformin and insulin action. In this rapidly moving field, what is certain is that our ability to discover common and rare variants will increase dramatically. Over the next few years we need to establish sufficiently large, cleanly defined cohorts to be able to utilise this technology. This is the biggest challenge.

No conflict of interest

SYMPOSIUM

LIVING WITH DIABETES

Exercise in prevention and management

0023

Diabetes, insulin and exercise - meeting the challenge

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Good glucose control (A1C <7) and avoiding serious hypoglycemia are only 2 of the many challenges facing those who live with insulin treated diabetes Exercise compounds these challenges, making "control" frustratingly unpredictable and at times downright hazardous.
It is not too long ago that people with T1D were actively discouraged from exercising and indeed much of what medical people now know has been gleaned from the collective experience of many active individuals who, often going against medical advice, determined to "do their own thing". From such a group of people was born the International Diabetic Athletes Association (now known as the Diabetes Exercise and Sports Association) which exists to help and encourage persons with diabetes to be physically active and some to pursue their dreams to be a professional or elite or even Olympic caliber athlete.
For the recreational athlete to exercise safely and for the competitive athlete to achieve peak performance, considerable skill and determination are required to juggle the multiple variables impacting blood glucose levels.
My presentation will draw largely from my own experience as an "MD with DM" - a busy physician living with T1D for over 50 yrs and being variously involved over the decades with track and field, soccer, rugby, racquetball marathons, triathlons and skiing.

No conflict of interest

0024

Exercise in pregnancy

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Pregnancy is a 'diabetogenic state' due to the production of anti-insulin hormones (human placental lactogen, growth hormone, oestradiol and cortisol) by the feto-placental unit. Resultant 'insulin resistance' may pre-dispose to gestational diabetes mellitus (GDM) especially after 20 weeks of gestation and may pose difficulties in glycaemic control in women with pre-existing diabetes complicating pregnancy. High body mass index (BMI) and weight gain during pregnancy may further increase 'insulin resistance'. Exercise increases peripheral utilisation of glucose and reduces insulin resistance. It is both safe and beneficial to the majority of pregnant women.
Recreational exercise during pregnancy is known to reduce the stress levels, reduce tiredness, improve sleep and to enhance the overall sense of physical and emotional well being, in addition to improving muscle tone and strength that helps women to adapt to physical changes occurring in musculo-skeletal system during pregnancy. They may also help prevent gestational diabetes, essential hypertension, excessive weight gain and its implications. Walking, swimming and aerobics are recommended to the majority of women during pregnancy, and medical supervision is required in women with cardiac or pulmonary disease, antepartum haemorrhage, severe pre-eclampsia, preterm rupture of membranes or severe anaemia. Contact sports (boxing, martial arts, ice hockey, basket ball) and sports that may affect the 'balance' (cycling in late pregnancy, down hill snow skiing etc.) should be avoided as they may predispose to maternal and fetal trauma. Exercise may increase core maternal temperature and if this exceeds 39.2 degrees Celsius, may be potentially teratogenic in the first trimester. Recently, it has been suggested that the risk of severe pre-eclampsia is increased if a woman excercises for more than 270 minutes/week in the first trimester. Most women would benefit from 30 minutes of recreational excercise every day throughout pregnancy to prevent gestational diabetes and to provide better glycaemic control for established diabetes.

No conflict of interest

0025

Exercise in school and home

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Practice of exercise is very important for children and young people with diabetes. In order to understand the benefit of exercise it is important to answer the following questions:

1. Why should children and young people with diabetes practice exercises?
2. What kind of exercises do we need to do?
3. When can we practice exercise and when not?

Exercises in school: It is important that exercise at school begun since the 1st year of school, until university studies. People with diabetes should be included in this program taking in account our particular needs. Generally the exercise program at school is three times in a week.

It is important to incorporate and participate actively with the rest of the students in the different activities, such as sports team.

Exercises at home: We should practice exercise at least 5 or 6 days per week, so we should complete our program at home. Exercise and sports is part of our life, is fun and make us feel closer with our group of friends. Dance is another kind of making exercise; this will also give us lots of pleasure and a group participation.

Precautions: In order to enjoy at most the practice of exercise we should be prepare to prevent Hypos and Hyper, so it is important to make blood test before, after certain period of time and at the end of exercise and act according the situation.

We must always carry on supplies for the occasion.(sugar, soft drinks, honey, insulin, etc)

Exercise is the milestone in the development of children and young people with diabetes that will allow us to incorporate healthy and happy to our society.

If we are correctly trained and prepared for the different possibilities, we will be able to practice any kind of exercise

No conflict of interest

0026

Should we exercise regularly: how much and how often?

C. McEnery[1]
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While exercise is a long-established health consideration for all, it is of greater necessity for patients with diabetes. Not only do the benefits of regular exercise that exist in the general population carry over to patients with diabetes, but there are further positive effects, some that serve to ameliorate the effects of Type 1 and some of Type 2, that result from a regimen of regular physical activity.

Beyond the promotion of a generally healthy lifestyle, the lowering of cholesterol, and other metabolic factors, exercise enables stabilization of blood sugars, and decreased weight and insulin resistance in people with type 1 diabetes. In patients with type 2 diabetes, within which population there is a high incidence of obesity, exercise promotes weight loss and a reduction of components of the metabolic syndrome. Indeed, Type 2 can be wholly reversible when exercise is paired with nutritional changes.

Although the benefits of exercise are widely known, a variety of deterrent factors exist for patients in the diabetes community. These factors can include: difficulty in managing blood sugar with different types of exercise (i.e. anaerobic vs aerobic), motivation, and knowledge regarding medication and exercise interaction.

While the effects of exercise are universally beneficial, the extent of its benefits varies within populations based on risk factors. In those populations with a high genetic predisposition to insulin resistance, exercise may be insufficient to ward off a diagnosis of Type 2 diabetes. Patients without such biological influences who are merely overweight may be able to entirely avoid diabetes through the implementation of a regular schedule of physical activity. The benefits of avoiding the development of Type 2 extend to greatly reduced risk for its accompanying complications.

No conflict of interest

SYMPOSIUM

EDUCATION

Diabetes in indigenous communities

0027

How to implement national diabetes education program

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Therapeutic education is an essential part of caring for people with diabetes. But how to implement it with efficacy is a question to deal with in our daily work. The purpose of this lecture is to reflect on this subject using our experience with a National Diabetes Education Program. When therapeutic education is designed and planned in a structured program, results are more efficient. First of all, it is necessary to identify the educational needs of participants taking into account their socio-economic and cultural context and the organizational needs of the service. The program will establish general principles with enough flexibility to adapt it, according to regional or ethnic differences. Secondly, philosophy and strategies of the education model must be defined. Third, subject matter must be adapted to the learning needs and evaluation must be part of the program from its design. The design started with a diagnosis research to establish the learning and logistic needs. The philosophy was to focus on a patient-centred approach. Methodologically, dialogue and group discussions were selected instead of classes or lectures. Having evaluated the strengths and weaknesses of the educational process, appropriate changes were introduced, and the program was extended with local adaptations to the different diabetes services. National coverage allows uniformity on diabetes education all over the country and facilitates the evaluation process. Results of evaluations have shown a better understanding of Diabetes in both health care providers and patients. Treatment adherence has also improved in patients, decreasing acute and long term complications. Diabetes education must be planned as an essential part of diabetes care, and a national program facilitates similar education possibilities to people with diabetes all over the country.

No conflict of interest

0028

Taking diabetes education and care to the Aboriginal communities in North Australia

A. Sinha[1], *B. Davis*[1]
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Diabetes is much more prevalent in Indigenous Australians than in the wider Australian community. The majority of these individuals also reside in very remote areas of North Queensland. The management of such patients presents serious logistic challenges because of their remoteness from expert medical care and supervision. Clinicians, including specialists, can contribute significantly to the secondary prevention of diabetes and its comorbidities and complications.

Since the early 2000s the Cairns Base Hospital Endocrine unit and the Diabetes Centre have used an innovative approach to outreach diabetes care in disadvantaged communities in Cape York and Torres Strait islands. The service travels to remote areas and provides comprehensive diabetes care to people with diabetes. The team is multidisciplinary and involves working with primary care physicians, remote area nurses and Indigenous health workers. Over the years the training of these individuals in basic diabetes care has evolved using nationally accredited training tools. The education component now constitutes a significant part of the outreach service and is the only way to maintain a sustainable service in these remote areas. More recently we have also introduced telehealth services for managing patients with diabetes foot problems and diabetes in pregnancy. Virtual ward rounds with remote area hospitals and clinics are now a routine part of the service provision.

In remote settings, appropriate management structures and clinical support for people with diabetes including education of nurses and health workers can lead to improvements in care processes, control of blood pressure, and preventable complications that result in reduced hospital admissions. Control of glycaemia and weight are more difficult and require active community engagement. There is a need for a change in our current management strategies for chronic diseases such as diabetes in remote areas.

No conflict of interest

0029

Indigenous communities in Eastern Europe (Gypsies)

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Introduction: Originated from Northern India, Roma population (gypsies) represents a particular ethnic minority in Eastern Europe, with a life philosophy incompletely understood. We aimed to analyze specific aspect of diabetes and diabetes care in gypsy communities in Eastern Europe.
Methods: Data have been collected by searching Medline publications, using the keywords "gypsy", "Roma population", "diabetes" and applying a questionnaire regarding specific data on diabetes care, sent to diabetologists in Eastern European countries. Following aspects were analyzed: demographics, prevalence, education level, social aspects, morbidity, diabetes care, glycemic control.
Results: Prevalence of Roma ethnic population in Eastern Europe ranges from 1% to 10% (10,000 to 1,500,000). The education level ranges from illiteracy in 40-60% to high level in 1%. According to specific health care legislation in different countries, 30% to 100% of Roma population has medical insurance, still diabetes medication is reimbursed. Although limited data are available, the main health problems in adult population seem to be cardiovascular disease, obesity, metabolic syndrome, pulmonary diseases, type 2 diabetes and infections, while in children, infectious diseases. Overall, life expectancy is lower. There is no available data concerning the prevalence of diabetes and its impact among Roma population, the main reason is that affiliation to a certain ethnic group is not mentioned in medical records. However, literature data and general opinion suggest that Roma-population has a higher risk for cardiovascular disease and a poorer glycemic control; the main reasons would be the unhealthy lifestyle and the low education level. Although specific European programs were developed aiming at social and cultural issues and supporting education and integration, majority of Roma population experiences a low socioeconomic status.
Conclusion: Optimizing diabetes care in gypsy ethnic communities involves wider political, economic, social decisions. Specific education and social support programs are needed, challenging economic systems in Eastern European countries.

No conflict of interest

0030

Diabetes education: challenges and solutions in resource poor countries of sub-Saharan Africa

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Aims: The aim is to highlight the challenges posed of scarce resources in Diabetes education in resource poor settings and possible solutions to address them.
Method: This is a descriptive survey using questionnaires to identify the resource related challenges and possible solutions in Diabetes education in resource poor settings of sub-Saharan Africa.
Results: Preliminary results indicate that restricted resources; human, financial and educational materials do adversely hamper Diabetes education. In the settings that have responded, the quality and hence impact of Diabetes education is not assured as no standards exist and secondly guidelines for the education process are lacking.
Restricted resources hamper access to training for health care professionals on the one hand and on the other, patients can hardly afford education.
Possible remedies listed are the need to advocate for education, it has an important role in Diabetes care. Others suggest integration of Diabetes care in the mainstream non communicable disease care. Public–private partnership may also address issues of staff training and acquisition of resources. Diabetes Centres can adapt guidelines and education standards from existing ones from the IDF international or the regional office. Partnering with centres of excellence in resource poor countries may provide useful ideas that can be adopted. Audit of education process and outcome would also inform on best approaches to take.
Conclusions: Diabetes education plays an important role in Diabetes especially regarding lifestyle modification and Diabetes self care. It has evolved from a primarily didactic to theoretic empowerment models. The emergence of Diabetes and related non communicable diseases poses a double disease burden to many countries in sub-Saharan Africa. It is therefore imperative that affordable effective approaches to Diabetes Education are identified and put in place to effectively address care needs.

No conflict of interest

TEACHING LECTURE

LIVING WITH DIABETES

Empowering people with diabetes

0031

Empowering people with diabetes

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People need life skills in order to put into action knowledge about managing diabetes. GOAL SETTING helps people to be in charge of their diabetes and their life.
PROBLEM SOLVING helps people to resolve the challenges encountered as they pursue their goals. MANAGING the STRESS of diabetes as well as the daily stresses of life helps to prevent problems and further stress. MOBILIZING SUPPORT means receiving the help of healthcare professionals, family, friends, co-workers and the general public. MOTIVATION is needed throughout a lifetime of managing diabetes.
A program teaching these life skills was evaluated and proved to increase self-efficacy, improve attitudes and resulted in a clinically significant improvement in A1c. A PERSONAL PATH TO RESPONSIBLE SELF-CARE was taught through the American Association of Diabetes Educators trained in the program. (DIABETES CARE, July, 1995)
Since self-management plays a critical role in successful diabetes management, there will be a discussion on how self-management education and diabetes education can be integrated to provide life-long support to people and families affected by diabetes.

No conflict of interest

WORKSHOP

Insulin for all: can we make it a reality?

0032

Accessibility, storage and distribution

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IDF global surveys have identified problems facing insulin access in developing countries. Insulin per person may cost almost six months of family's income. High costs in private sector, low availability in public sector, withdrawal of cheaper animal insulin, transportation difficulties, inaccessible electricity and refrigerators, and lack of long-term international support are some important problems. Measures proposed or tried are exemption from taxes, making generic products available, price negotiation, differential pricing, pooled procurement, public-private initiatives, RAPIA by IIF, Association Twinning Initiative etc. Insulin can lose its potency during improper transport and storage without cold chain maintenance. Apart from common complications, use of such insulin with decreased potency lead to hyperglycemia with resultant need to increase dose and later on when a new bottle of insulin is started with the increased dose, the patient may develop hypoglycemia. This I had reported as "Hyperglycemia followed by hypoglycemia – Reverse Somogyi – phenomenon".
In essence there are inadequate purchasing and countrywide distribution systems in many developing countries. Private distribution systems selling human insulin operate mostly in urban areas through wholesalers and pharmacies. Availability of cheaper animal insulin is getting difficult due to financial imperatives that drive pharmaceutical business. Considering efficient distribution system, with cold chain maintenance, of Expanded Programme on Immunization in developing countries, IDF collaboration with WHO, international immunization agencies and pharmaceutical industries to supply

animal insulin along with vaccines can solve the problems. Incorporating only animal, not human, insulin seems essential to make the programme feasible. It will also prevent later influences from pharmaceutical sectors to include other products in the programme. Affluent population can get human insulin through private or other distribution systems. International initiatives to collaborate with immunization programme with worldwide bulk supply of cheaper animal insulin can preserve access to animal insulin and make "Insulin for all" a reality.

No conflict of interest

0033

Cost, affordability and availability

R. Williams[1]
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For a person dependent on exogenous insulin, access to that insulin is a basic human right and should not be a lottery the result of which is dependent on where they live, their age, gender, economic status or any other factor. This presentation will explore, amongst other aspects of this topic, the questions: Is insulin becoming more affordable and available globally? If not, what are the current barriers? To what extent is cost an issue? If so, how can accessibility be facilitated? What are the roles of government, diabetes associations, the private individual and the commercial sector?
Acute shortage and inaccessibility of insulin as a result of natural or man-made disasters are readily understood. An infrastructure exists to minimise morbidity and mortality in these situations. Chronic inaccessibility, however, is less easily rationalised and cannot be tolerated. Even when cost and affordability are not barriers and when insulin is available, cultural barriers still mean that inequalities are created where none should exist.

No conflict of interest

0034

Insulin for all

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Almost 90 years since insulin therapy was developed, untold thousands of people with diabetes in low-income countries die because they cannot readily access or afford it. Many more people with diabetes would benefit if insulin were available to them.
In the developed world, insulin is readily obtained through health systems. In low and lower-income countries, some governments provide insulin free or at a low, affordable cost. In others, insulin must be purchased by the individual concerned. The annual cost is US$200-500, which may be more than the family's annual income. Furthermore, despite insulin being recognised as an essential medicine, the supply of insulin through health systems may be intermittent even in cities, and it is often not available at all in rural clinics.
The most common causes of this situation are under-resourced (and sometimes also dysfunctional) health systems. Others causes include taxes and duties on insulin in some countries, problems with ensuring the cold chain, and lack of health professional expertise concerning diabetes. Replacement of types of insulin by newer types which have added benefit, but are more expensive (e.g. human for animal, analogue for human) may also increase prices, as can new delivery devices.
This is an unacceptable situation, and many efforts are underway to address it. These include advocacy by the International Diabetes Federation (IDF) and its member associations to encourage Governments to provide insulin, the IDF's ***Life for a Child*** Program which supports the care of children, Insulin for Life which redistributes unused insulin, the International Insulin Foundation's country studies which identify how availability can be improved, and programs by some insulin manufacturers to make insulin more affordable. An increased number of manufacturers is also leading to lower prices in some regions. These are all positive developments, but comprehensive solutions will be needed before all have access.

No conflict of interest

0035

Insulin in disaster - supply on time saves lives

R. Raab[1]
[1] *Insulin for Life, (President), Victoria, Australia*

A gap of more than a few days in insulin supply can result in death for those who depend on it. To save lives in disasters requires an immediate response, with the ability to send, receive and distribute insulin very quickly. In reality "disasters" are happening every day because there are many who die because they cannot access insulin.
Insulin for Life (IFL) Australia, with affiliates in Austria, Germany, UK and USA (IFL Global), collects and distributes donated in-date insulin, test strips and other diabetes supplies to recognized organizations, with an agreed protocol, following specific requests.
These are donated following emergencies, and on a long-term sustainable basis to countries in need. A stock of insulin is held for emergency requests, ready to be sent immediately. IFL Global donates approximately 250,000 ml insulin yearly (equal to 25,000 x 10 ml vials, or 83,300 x 3 ml cartridges), and test strips, syringes, glucose meters, insulin pens, pen needles and other supplies.
Emergencies responded to include the Indian Ocean Tsunami (2001); Hurricane Katrina (2005); the Peru earthquake (2007); China earthquake (2008); the war in Georgia (2008); and Zimbabwe (2006-9). Most of these had IDF support for transport and handling costs, as part of an agreement with the IDF to respond to emergencies.
Collection, storage, freight and communications channels need to be ready in advance and be able to be very quickly activated. IFL maintains these systems and is ready to send insulin at a day's notice, with arrival within a very short period, in time to save lives that may otherwise be lost.
More information is at www.insulinforlife.org

No conflict of interest

OPEN FORUM

ASSOCIATION DEVELOPMENT

Diabetes care and disasters

0036

The role of associations in disaster management

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History has always shown the enormous destructive power of nature. Up to now man has not been able to create a complete protection against natural disaster. SACA executive committee has faced up the way to be capable and efficient in any kind of natural or man-made disasters.
The basic attention in case of disasters is based on the following principles:
1. Evacuation of the people living in affected areas
2. First aid
3. Immediate epidemiological activities
4. Shelter and food to victims of the disaster

First of all, it is important to give answer to the following questions:
1. How many people live in SACA Region?
2. How many people with Diabetes live in SACA Region?
3. How many natural or man-made disasters have occurred in the last years in our region?
4. How many people have been affected due to disasters in our region?
5. How many people with diabetes could have been affected due to disasters?
6. What is doing our region in order to improve the attention to people with diabetes in case of disasters?
7. What do we propose as SACA/IDF?

Our goal is reduce morbimortality of people with DM in the aftermath of a natural or man-made disaster.
Raising awareness in diabetes will enable: To engage suppliers and allied health related organizations, to address the need for a standardized approach

to diabetes in the disaster setting. To provide education on diabetes treatment in disaster.
In order to reach our goals our Project has 4 target audience: 1- Government, 2 - Associations, 3 - Organizations and health workers dealing with disasters, 4 -Community in general.
It is important to involve as many people as possible and create general consciousness about the severity of the problem.
IF WE DO SO, OUR REGION IS PREPARED.

No conflict of interest

0037

What can associations do in the face of disasters ?

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It is estimated that 7% of the world population have Diabetes and large number of the Caribbean population have Diabetes. According to the IDF statistics there are 200 associations operating in 160 countries. In the Caribbean there are 19 Associations scattered across the Caribbean Sea and are faced with a number of disasters every year.
As we are aware, disasters form part of our lives since they occur naturally and are also created by man. Every country in the Caribbean and North America has a Disaster Response Organization which deals with and coordinates disaster effort. But the question is always can they do enough?
Diabetes care takes a lot of planning. So that unexpected events such as floods, tornados, earthquakes and hurricanes make diabetes management more difficult. And as we know despite unlimited resources the Disaster Response Organization cannot by themselves respond adequately to meet the need of Diabetics. This is where the Diabetes Associations can play their part.
The participants will be introduced to what are the problems being faced by the local Disaster Response Organization in respect to diabetics, and to what the Diabetes Associations can do to assist their local Disaster Response Organization when faced with natural and man-made disasters.

No conflict of interest

SPEAKERS' CORNER

Strengthening structure and communications within IDF

0038

Strengthening structure and communications within IDF

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IDF has to faithfully assisted member-associations with managing and fundraising strategies, to help them to become better communicators, to foster membership growth and to increase Diabetes Associations' impact.
Aims: Globalization
1. To increase an influence of Diabetes Associations in society
2. To develop a public education strategy
3. To develop an involvement strategy
4. To strengthen horizontal ties
5. To build uniform information network
6. To form new generation

Methods:
1. Analyzing situation in regions
2. Twinning
3. Renewing Diabetes magazines Committee
4. Building data bank of member-associations best practice and resources
5. Enriching resource of IDF and each member-association
6. Decreasing costs by using general resources
7. Leadership for youth
8. Granting newborn DAs
9. Training for DAs' Staff
10. Training on workplaces
11. Leaderships
12. Guidelines for management of DA

BEST PRACTICE
Ukrainian Diabetes Federation's experience
1. Positive example of fruitful twinning between BDA and UDF (1992-1997)
2. Protection of Patients rights together with the national Medical Law Association (from 2004)
3. Continual school for regional leaders (from1998)
4. Creation Ukrainian Union of Patients' Organizations "Health of the Nation" (2006)

Successful example of international horizontal communications
Eastern European DAs' summits - 7 years experience
1. Model Law "On Principles of Medical and Social Protection of Diabetes Patients" adopted 20 December 2004 by IPA of CIS countries
2. Agreement of Governments of CIS Countries about common diabetes policy 14 November 2008

Focusing on Youth projects
1. International Diabetes Youth Festival

"DNIPRO-2006"
"Ukraine-ARTEK-2007"

No conflict of interest

PRESIDENTIAL ORATION

United we stand - a global diabetes strategy

0039

United we stand - a global diabetes strategy

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History will undoubtedly mark the passage of the United Nations Resolution on Diabetes (UN 61/225) on December 20, 2006, as the turning point in the recognition of diabetes as a threat to world health. The success of the IDF-led campaign for a UN Resolution was made possible by the "diabetes world" coming together under the "unite for diabetes" banner using the blue circle as the symbol of diabetes.
The IDF has grown to be a federation of over 200 national associations in 162 countries. The membership of these associations is in excess of 2 million. The IDF is one of the largest consumer advocacy groups globally but, despite this, the voice of those affected directly or indirectly by diabetes has too often been ignored or not heard.
Much progress has been made over the past 3 years, both at the political and infra-structure level, but much more needs to be done to fulfil IDF's mission of promoting diabetes care, prevention and a cure. The IDF Atlas is now used as the data source by the WHO, World Bank and the OECD. The first IDF Centres of Diabetes Education have now been accredited in several regions of the world using IDF-based standards and curricula. Health economic studies have been undertaken in Africa, China, South-East Asia and Latin-America. The IDF's Life for a Child Program has expanded greatly, with generous donations of insulin allowing over 4,000 children to be supported in 20 countries by the end of 2009, and enough insulin being pledged to support 12,000 children in 2010, 19,000 in 2011 and 25,000 in 2012. Up-to-date versions of IDF clinical guidelines on type 1, 2 and gestational diabetes and Position Statements on screening, metabolic syndrome, and oral health have been released. World Diabetes Day, now a UN World Day, aims to educate, energise and empower and now reaches over a billion people worldwide.
The IDF recognises that global and national approaches are needed for both primary and secondary prevention. The burden of diabetes threatens to subvert the achievement of internationally agreed development programs, including the Millennium Development Goals. The IDF supports the WHO Action Plan for the Global Strategy for the Prevention and Control of Non-communicable Diseases.
At the United Nations, the IDF is campaigning for a UN General Assembly Special Session on NCDs. We are asking for a UNITAID-type program for essential NCD medicines, a single Global Fund for Health, the integration of NCDs into primary health care systems and the broadening of the Millennium Development Goals to include NCDs.
The world has never before had to cope with an epidemic of non-communicable diseases. Non-communicable diseases are now responsible for 60% of global morbidity and premature mortality. The diabetes epidemic now affects over 250 million worldwide with the major burden (80%) in the developing world.

Solutions will not be easy but what is clear is that the "diabetes world" needs to be part of the solution.

No conflict of interest

ORAL PRESENTATION

CLINICAL RESEARCH

Foot care

O-0040

A new approach for healing stimulation: autologous platelet gel in chronic deep diabetic foot ulcer

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Aims: Evaluate feasibility, safety and efficacy of autologous platelet gel for chronic deep diabetic foot ulcers healing stimulation.
Methods: 100 diabetics (age 66,3±11,3 years) all neuropathic, macroangiopathic (n=66) with deep chronic foot ulcerations (n=115, ulcers duration: 6,1±5,5 months) with extension to tendon, bone or joint. The immediate causes of ulcers are biomechanical stress with abnormal plantar pressure (n=50)(PU), callus, ill-fitting foot wear for the dorsal or lateral side of toe (n=65)(ST). Before any application, good standards of wound care were used: skin, subcutaneous tissue, tendon, bone surgical debridement until the wound is free of infection, infection medical management, medical management of comorbidities and off loading (unremovable below knee cast, removable below knee bi-valve polyester cast, wheelchair, plastazote pressure redistributing insole in appropriate shoes, half shoes). Gel is obtained from patients, blood separating rich (RPP) and poor platelet plasma (PPP) by 2 methods, RPP blended with thrombin from PPP (n=42, Angel system), RPP with thrombin from whole blood (n=58, RegenLab system). Gel is used 1-5 times/ patient. No dressing change during 3-4 weeks only protective compress change at home once weekly except for maceration twice weekly.
Results: PU treated by gel with thrombin n=26: Complete healing n=20, after 1 application n=15, after 2 applications n=4, after 4 applications n=1. Improvement n=6, after 1 application n=2, after 2 applications n=2, after 3 applications n=1, after 4 applications n=1. PU treated by gel without thrombin n=24: Complete healing n=17, after 1 application n=13, after 2 applications n=4. Improvement n=7, after 1 application n=5, after 2 applications n=2.
ST treated by gel with thrombin n=24: Complete healing n=23, after 1 application n=11, after 2 applications n=6, after 3 applications n=4 after 4 applications n=1, after 5 applications n=1. Improvement n=1 after 2 applications. ***ST treated by gel without thrombin n=41***: Complete healing n=34, after 1 application n=20, after 2 applications n=7, after 3 applications n=3, after 4 applications n=4. Improvement n=6, after 1 application n=4, after 2 applications n=2. One lost to follow-up. Improvement was estimated on wound depth, size and bone shock disappearance. Autologous gel separation system can be used by health professionals in traditional health care facilities.
Conclusion: available to outpatient clinic and home care staff, when added to good standards of care, autologous platelet gel enhance diabetic chronic severe foot ulcer healing without adverse events.

No conflict of interest

O-0041

The effectiveness of the "Step by Step" foot care project in reducing rates of amputation among persons with diabetes-associated foot ulcers

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Background: Diabetic foot complications are increasing in Tanzania and are associated with substantial morbidity, mortality, and healthcare costs. Thus, in 2005, the Step by Step Foot program was instituted in 14 regions where rates of referrals of patients with diabetic foot complications were high.
Objectives: We carried out the current analysis to determine the effectiveness of the "Step by Step" intervention in reducing rates of amputation among persons with diabetic foot ulcers who were referred to the diabetes clinic at Muhimbili National Hospital (MNH).
Methods: The "Step by Step" training programme has been described in detail in published literature and is designed to achieve the following: (i) train healthcare practitioners (HCP) in diabetic foot management; (ii) facilitate the transfer of knowledge and expertise from HCP with training to those without; (iii) reduce rates of foot complications by education, early detection, prompt and appropriate treatment; and (iv) develop an infrastructure for support and service development. We monitored secular trends in amputation rates among patients referred to MNH during 2001-2008 (study period). The denominator was defined as the total number of patients with diabetes referred to MNH with foot complications.
Results: During the study period, the mean annual amputation rate among referrals was 17.6%. Before the Step by Step program, trends in rates of amputation were upward and had increased to >1 standard deviation (SD) above the mean by 2005. Following the institution of the program, rates of amputation among referrals significantly decreased to a low of 1 SD below the mean in 2007 and 2 SD by 2008 ($p < 0.01$).
Conclusion: Institution of the Step by Step Foot Project in 14 regions in Tanzania resulted in a significant reduction in overall rates of amputations among patients with foot ulcers referred to a large tertiary centre in Dar es Salaam. These data suggest improved foot ulcer management at the regional level following Step by Step, before referral for specialist care. These data also underscore the importance of surveillance activities for diabetes complications in measuring outcomes of interventions.

No conflict of interest

O-0042

Characteristics of diabetic foot in the Western Pacific Region - ASIPAC foot study

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Background: The number of diabetic foot lesions and consequently amputations is increasing in the Western Pacific region (WPR). However, there are no foot care specialists such as podiatrists or chiropodists in WPR and there is much ignorance amongst medical staff as to how to identify and educate those at risk and treat those who develop problems.
Aims: The aim of this study (ASIPAC FOOT STUDY) was to investigate the characteristics of diabetic patients with foot ulcers in 7 hospitals in 7 countries (Vietnam, Philippines, Indonesia, China, Mongolia, Thailand and Japan), and to increase awareness of diabetic foot problems in WPR.
Methods: The study population includes 309 hospitalized patients presenting with a new foot ulcer in 2008. Data on patient characteristics, as well as foot and ulcer characteristics were obtained.
Results: General patient characteristics were different in all countries. Some countries did not show a higher prevalence of foot ulceration in men (Men (%): 42.1 in Vietnam (V), 46.7 in Indonesia (I), 51.2 in Philippines (P), 55.6 in Mongolia (M), 68.3 in Japan (J), and 72.7 in China (C)). Younger patients with shorter duration of diabetes were more affected in some countries (Mean age (years) /duration of diabetes (years): 54.3/4.4 in I, 56.6/7.1 in P, 59.3/2.6 in M, 63.3/7.8 in V, 65.8/20.9 in J, and 66.3/13.7 in C). Poor glycemic control prior to admission was a common problem (Mean HbA1c (%): 13.2 in M, 9.6 in V, 9.4 in I, 8.7 in P, 8.6 in C, and 8.3 in J).
Extrinsic factors of ulceration were trauma, especially on bare foot walking, shoe sore, burn, and ischemia. Neuropathy was diagnosed in 66.7-92.7 % of

the patients, while peripheral arterial disease (PAD) in 24.4-86.3%. Smoking rates were high in most countries (66.7% in M, 45.5 in C, 43.2 in P, 42.3 in I, 38.9 in J and 20.5 in V). Infection was complicated in 59.1-100 %. Many patients came to the hospital late after the onset of the wounds (days until presentation (mean / median): 47.5/20 in C, 33.9/21 in P, 28.5/20 in V, 27.1/28 in I, 27.7/14 in J, and 16.4/14 in M). The amputation rate was 17.1-61.0%, while major amputation was 1.3-48.8%. Revascularization to PAD patients was not performed in V, I, M, and P.

Conclusion: The characteristics of diabetic foot patients in WPR were much different in some points from those reported from other region such as Eurodiale study. Diabetic foot patients with PAD seem to be increasing in this region, while smoking rates are high and revascularization is seldom applied. In order to reduce amputations, it is essential to increase awareness of diabetic foot and tobacco problems, and improve the skills of screening and education of high risk patients and management of foot ulcer through regional professional training program.

No conflict of interest

O-0043

First lower extremity amputations among persons with diabetes in Finland (FinDM II study)

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Aims: In earlier research the reported incidence of first lower extremity amputations in persons with diabetes varies markedly between countries. We investigated the situation in Finland during 1997-2007.

Methods: The FinDM II - study uses individually linked data from several Finnish national administrative registers. All persons diagnosed for diabetes were identified from five sources: the Hospital Discharge Register (1969-2007), the Health Insurance Registers on reimbursement of antidiabetic medication (1994 – 2007) and on entitlements to elevated reimbursement of the medication (1964-2007), Medical Birth Register (1987-2007) and Register of Causes of Death (1988-2006). All first lower extremity amputations for these persons were identified during the period 1997-2007 with the data from the Hospital Discharge Register.

Results: In the study we identified 637 585 persons with diabetes and 7 906 of them underwent at least one lower extremity amputation during the follow-up. In women the trend was decreasing with both type 1 and type 2 diabetes. The decrease was over 30% in both subgroups (31% in type 1 and 38% in type 2 diabetes). Among men the development was not uniform: men with type 1 diabetes showed no decrease in amputations during the follow-up but among men with type 2 diabetes the rates decreased by 29%.

61,5% of the first amputations were major amputations performed above the ankle. A significant decreasing trend was observed with the first major amputations in persons with both type 1 and type 2 diabetes both in men and in women. For women with type 1 diabetes the decrease in 1997 – 2007 in first major amputation rates was as high as 57%.

Conclusion: The risk of first lower extremity amputations among persons with diabetes has significantly decreased in Finland since the late 1990s. However, our study showed considerable differences in time trends for amputation risks between genders, age-groups and types of diabetes which suggests that Finnish health-care organizations need to meticulously evaluate practices to deliver diabetes care and identify persons with diabetes at risk for foot complications.

No conflict of interest

O-0044

The Caribbean Step by Step diabetic foot care programme - a unique collaboration of the International Diabetes Federation and Rotary Club of Ledbury

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Introduction: In the Caribbean Region the prevalence of diabetes and the incidence of diabetic lower extremity amputations (LEA's) are very high. Ignorance and lack of preventive measures are the main causes of the problem. The International Diabetes Federation (IDF) and the Rotary Club of Ledbury (RCL), working with other UK and Caribbean RC's will carry out foot care programmes across the Caribbean in order to reduce the number of amputations.

Aim: The programmes will be based on the Step by Step model, which aims to improve diabetic foot care in the developing world by providing education for people with diabetes and healthcare professionals in the prevention and treatment of diabetic foot problems.

Methods: In 2008, the International Diabetes Federation approved funding for a joint project between the RCL and the IDF Consultative Section on the Diabetic Foot. Led by RCL, matching funds have been raised by Rotary Clubs, Districts and the Rotary International Foundation. Further funding has been secured from the World Diabetes Foundation. Step by Step has been effective in improving diabetes foot care in a number of developing countries, such as India, Tanzania, and Pakistan. It has set up practical training courses for teams of healthcare professionals (teams of doctors and nurses or other paramedics) and provided them with special educational materials. Built into the project is a session to teach participants how to train other healthcare professionals. They are encouraged to disseminate information through training so that they cascade their acquired knowledge and skills to colleagues in their local settings. The courses are held over a two-year period. IDF and RCL carried out a survey to identify sites in the Caribbean where to hold the first phase of training courses. Five islands were selected: Barbados, St Lucia, St Maarten, St Kitts, and the British Virgin Islands. Site visits to these islands have been carried out, and the programme will start in 2009-2010. A local and international medical faculty will be responsible for the training courses. The project has received the support of the Ministry of Health, local patient associations and Rotarians on each island.

Outcome: The expected outcomes include sustainable improvements to foot care in the target countries; increased awareness of diabetes and its complications; and improved links between civil society and diabetes healthcare professionals. The most important outcome will be reduced amputations and improved quality of life for many people with diabetes in the Caribbean.

Summary: In 2009-11, IDF and RCL will implement a Step by Step programme in the Caribbean to create sustainable improvements in foot care so as to reduce LEA's and improve quality of life for many people living with diabetes in the Caribbean.

No conflict of interest

O-0045

Charcot neuroosteoarthropathy in diabetic patients after transplantation is associated with diabetic retinopathy

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Background and aims: Charcot neuroosteoarthropahy (CNO) is a late complication of diabetes that can lead to amputations of the foot and a decreased quality of life. The risk factors for CNO after pancreas-kidney (PK) transplantation or pancreas transplant alone (PTA) are still unknown. The aim of our study was to evaluate prevalence of CNO after PK transplantation or PTA and get insight into possible risk factors for acute CNO after transplantation.

Patients and methods: From May 1993 to December 2008, 318 pancreas transplants (279 PK transplantation and 39 PTA) were performed at Institute for Clinical and Experimental Medicine in Prague. After transplantation, the diagnosis of acute CNO was based on clinical and radiological findings and confirmed by bone scan. Possible risk factors for CNO were evaluated before transplantation – gender, age at the time of transplantation, duration of diabetes, necessity and duration of dialysis before transplantation, type of transplantation, the presence and grade of diabetic retinopathy (assessed by ophthalmologist with photo documentation), peripheral neuropathy (biothesiometer), autonomic neuropathy (Ewing's tests and spectral analysis of heart rate variability), ischemic heart disease. After transplantation, functioning of graft(s), rejections and glycemic control were recorded. The group of patients with CNO after transplantation was compared with patients without CNO either before or after transplantation. Stepwise logistic regression was used to determine which of the factor(s) are associated with Charcot foot occurrence after transplantation. The mean follow-up period was 71.4±48.4 months after transplantation.
Results: Acute CNO was diagnosed in 23/318 (7.2%) patients after transplantation (6 patients had recurrence and 17 patients had new development of CNO). There were 277/318 (87.1%) patients without CNO either before or after transplantation. In univariate analysis, patients with acute CNO after transplantation were significantly younger in comparison with patients without CNO (38±7.4 vs. 43.1±9.1; $p<0.01$) and had significantly higher grade of diabetic retinopathy (95.7% vs. 73.9%; $p<0.03$); other assessed factors were not significant. Stepwise logistic regression has shown that lower age at the time of transplantation (Odds ratio [OR]=1.07, 95% CI 1.01-1.12) and higher grade of diabetic retinopathy (OR=7.33, 95% CI 0.96-56.3) are significant risk factors for CNO after transplantation; other assessed factors were not significant.
Conclusion: CNO after transplantation was more frequent in younger patients with higher grade of diabetic retinopathy which should be in accordance with more severe microvascular impairment.

No conflict of interest

O-0046

Pilot study on the anthropometry and biomechanics of the diabetic foot

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Introduction: Available literary sources show no reference of extensive research on the feet sizes of diabetics. In terms of our work, supported by the TANDEM FT –TA3/096 grant, we measured foot lengths and circumferences of our retirement age type 1 and 2 diabetic patients.
Aim: Our aim was to determine the shape of a diabetic patient's foot in four critical sections, and subsequently evaluate these in relation to sex, duration and compensation of diabetes.
Group: Data was obtained from 614 patients, 72% (441 patients) of which were type 2 diabetics, 27% (166 patients) type 1 diabetics and the remaining 1% (6 patients) include other types of diabetics. The group consisted of 51% (314) men and 49% (300) women. The average patient's age was 51 years regardless of his or her sex.
Methodology: Measuring was carried out in diabetology outpatient clinics at the diabetology department of Motol Faculty Hospital. This process was executed using a scanner controlled by specially developed software, enabling quick data evaluation and the displaying of foot dimensions in 3D.
Results: We obtained precise circumferential dimensions of diabetes patients, including the shape of cross-sections in four critical sections. The unpaired t-test confirmed the statistically significant difference in the foot shapes of patients with diabetes according to sex, $p < 0,05$. An ascending linear trend between the width and size of the foot was discovered within the same size groups. The uniqueness of our measurement lies in discovering the cross-sections of the foot differed at the toe joints of randomly selected diabetic footwear in comparison with the cross-section of the diabetic's foot, even though the circumferences were identical.
Conclusion: The 3D scan of our diabetic patients demonstrated the increasing trend of feet size and width, a difference in the shape of feet was proved on patients with diabetes according to sex. We obtained precise circumferential dimensions of diabetes patients, including the shape of cross-sections in four critical sections. The information could support the development of safer footwear for diabetics in the future.

No conflict of interest

O-0047

A prospective study on diabetic foot ulcers and mortality: the Nord-Trøndelag Health Study, Norway

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Background: It has been suggested that the elevated mortality rate among people with diabetic foot ulcers is related to comorbid disease such as cardiovascular disease and nephropathy or psychological factors including depression.
Aim: The aim of the present study was to assess mortality rates for persons with diabetes with and without a history of foot ulcer (HFU) and for the nondiabetic population in a large population-based study, taking into account the effect of potential confounding factors.
Research design and methods: The study included 1,339 persons with diabetes without a HFU, 155 persons with diabetes with a HFU, and 63,632 nondiabetic persons all followed for 10 years with mortality as the end point. Information on mortality was obtained from the Norwegian Causes of Death Registry using the Norwegian 11-digit personal identity number unique for each resident. Participants with self-reported diabetes were well characterized with regard to their diabetes, and information on demographics, lifestyle, prevalent disease, and depression was available.
Results: Analyses show that 49.0% of persons with diabetes with a HFU died, 35.2% of persons with diabetes without a HFU and 10.5% of the nondiabetic persons died during the study period. In Cox regression analyses, adjusted for demographic and lifestyle factors, having a HFU was associated with more than a twofold (2.29 [95% CI 1.82–2.88]) hazard risk for mortality compared to the nondiabetic group. In corresponding analyses in persons with diabetes, a HFU was associated with a 38% increased mortality (1.38 [1.07–1.78]). The estimated effects of a HFU on mortality did not change markedly when also microalbuminuria, cardiovascular disease, and Hospital Anxiety and Depression Scale depression scores were included in the model.
Conclusion: This large community-based study showed that foot ulceration is a marker of increased mortality risk among persons with diabetes, and underlines the importance of organizing future health care services with follow-up routines that allow for early and tight clinical monitoring in persons with a HFU in primary care.

No conflict of interest

ORAL PRESENTATION

FOUNDATION SCIENCE

Mechanism of obesity

O-0048

The fibrosis promoter SPARC and its relation to the collagen-like adipokine adiponectin in human obesity

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Background and aims: Circulating Secreted Protein, Acidic and Rich in Cysteine (SPARC, also known as osteonectin) is predominantly derived from adipose tissue (AT) and is a mediator of collagen deposition and fibrosis. We have previously shown that its expression in AT is increased in human obesity and responds to weight change. We also reported upregulation of AT SPARC with insulin treatment in vitro, and increased expression of SPARC in subjects

with insulin resistance. SPARC is proposed to influence the composition of the extracellular matrix of adipose tissue and its collagen content and whilst adiponectin belongs structurally to the soluble-defence-collagen superfamily, the aim of this study was to determine a link between SPARC and adiponectin expression.

Methods: Morbidly obese non-diabetic subjects undergoing bariatric surgery (BMI=46.8±1.9(mean±SD)kg/m^2,n=37) and lean controls undergoing elective surgery (BMI=23.6±0.8kg/m^2,n=18) had serum, visceral-AT(VAT) and subcutaneous-abdominal-AT(SCAT) taken. Serum adiponectin levels were measured by ELISA and AT-derived mRNA expression by Real-time PCR and adjusted to ß-actin.

Results: SPARC expression was higher in SCAT than VAT (0.81±0.06(mean±SE) Signal Units(SU) versus 0.51±0.05SU,p<0.001,n=47) which was similar to the higher expression of adiponectin in SCAT (2.84±0.8SU versus 1.54±0.5SU,p<0.001,n=47). AT-expression of SPARC and adiponectin was similar in men and women, whilst serum adiponectin was higher in women (0.94±0.07ng/ml) versus men (0.81±0.05ng/ml, p<0.05). SCAT-adiponectin but not VAT-adiponectin correlated with circulating adiponectin (r=0.30, p<0.05) and SCAT and VAT-derived SPARC expression showed a positive correlation with fat mass (r=0.4, p<0.01). In contrast, adiponectin expression was lower in obese subjects and correlated negatively with fat mass (SCAT: r=-0.41,p<0.01; VAT: r=-0.43, p=0.003; serum adiponectin: r=-0.45, p=0.001). SCAT-SPARC correlated negatively with SCAT-adiponectin expression (r=-0.3, p<0.05) whilst no correlation was found for SPARC and adiponectin VAT-expression after correction for fat mass.

Conclusion: Similar to adiponectin, SPARC expression is higher in SCAT and whilst adiponectin decreases, SPARC increases in human obesity. SCAT-adiponectin appears to play a bigger contribution to circulating adiponectin levels and whilst SCAT-SPARC and adiponectin are negatively correlated and this independent of fat mass, our data suggests a regulation of adiponectin by SPARC which requires further evaluation by mechanistic studies.

No conflict of interest

O-0049

Loss of the Prader-Willi Syndrome candidate gene Magel2 alters appetite and energy balance

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Our laboratory identified the Prader-Willi Syndrome (PWS) candidate gene MAGEL2 as a circadian output gene expressed in the hypothalamus, a region of the brain important for homeostatic functions including growth and reproduction, sleep and wakefulness, and appetite and metabolism. People with PWS, a genetic disease, have significant appetite and metabolic disturbances, including an early failure to thrive followed by childhood-onset hyperphagia and low metabolic rate. In the absence of strict dietary and behavioral intervention, people with PWS progress to morbid obesity, insulin resistance, and type-2 diabetes. Proposed associations between circadian rhythm and normal metabolic function prompted us to examine appetite and metabolism in transgenic mice lacking Magel2, referred to as ***Magel2***-null.

We have previously shown that as in PWS, ***Magel2***-null mice show reduced weight gain in the pre-weaning period, followed by accelerated weight gain and increased adiposity as adults. This increased weight gain appears to be the result of a dramatic reduction in activity compared to control animals, with only a modest reduction in food intake, leading to a relative hyperphagia in the ***Magel2***-null mice. We now show that mice lacking ***Magel2*** respond abnormally to an acute energy challenge in the form of a 36-hour fast. After the fasting period, ***Magel2***-null animals lost a smaller percentage of their initial body weight compared to control animals. Upon refeeding, ***Magel2***-null mice showed a blunted reflex hyperphagia response, consuming significantly less food than control animals, leading to slower weight re-gain and reduced feeding efficiency.

The arcuate nucleus (ARC) is a key region of the hypothalamus involved in both short and long term energy balance. Key neuropeptides in the ARC include the orexigenic neuropeptide-Y (NPY) and the anorexigenic pro-opiomelanocortin (POMC), which are up- and down-regulated by fasting respectively. To examine if loss of Magel2 affects NPY or POMC levels in the hypothalamus, we are using quantitative reverse transcriptase PCR on both fed and fasted animals. Alterations in hypothalamic neuropeptide levels may explain some of the changes seen in ***Magel2***-null mice. For example, a failure to increase NPY levels upon fasting could reduce reflex hyperphagia.

Circadian rhythm is emerging as an important factor in metabolic function, highlighted by recent studies using animal models of obesity, hypertension, and diabetes. Our work further highlights the role of circadian function in appetite and metabolism, and provides a valuable model to understand how circadian alterations can affect specific hypothalamic pathways involved in appetite and energy balance.

No conflict of interest

O-0050

Chemerin is an adipokine related to insulin resistance and decreasing after bariatric surgery in morbidly obese patients

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Aims: Adipose tissue is an endocrine active organ producing various adipokines including the newly described chemokine chemerin. We could recently demonstrate that chemerin induces insulin resistance in skeletal muscle cells in vitro. The role of chemerin in obesity and type 2 diabetes remains unclear and has not been investigated after bariatric surgery.

Methods: Chemerin plasma levels were measured in 60 morbidly obese female patients (BMI 50.0±1.0, age 43.1±1.5) before surgery as well as 3, 6 and 12 months after surgery. In a subgroup of 27 patients, chemerin levels were monitored for 2 years. At all time points blood levels of insulin, glucose, HbA1c, cholesterol, HDL, triglycerides, CRP, leptin, adiponectin and IL-6 were assessed in addition to weight and BMI.

Results: Chemerin concentrations are substantially elevated in obese patients compared to concentrations for normal weight persons (353.8±18.0 ng/ml compared to approximately 250 ng/ml described in the literature). Preoperatively, chemerin levels are correlated positively with body weight, BMI, CRP, IL-6 and insulin sensitivity (HOMA). Furthermore, chemerin is correlated negatively with HDL levels. After bariatric surgery, chemerin decreased significantly (275.6±17.9 ng/ml after 3 months, 255.9±12.0 ng/ml after 6 months and 253.0±14.9 ng/ml after 12 months) in parallel to leptin levels but different from IL-6 that only displayed a marked reduction 12 months after surgery and adiponectin that was significantly increased after 6 and 12 months. In the subgroup of patients studied for 2 years, chemerin levels significantly decreased between 1 year and 2 years after surgery (preoperative 381.7±28.0 ng/ml, after 1year 290.7±26.9 ng/ml, after 2 years 215.1±14.7 ng/ml). 3 months after surgery chemerin levels only positively correlate with triglycerides, a correlation that was remaining apparent after 6 and 12 months. The prominent decrease of chemerin in the first 3 months after surgery was significantly associated with the increase in insulin sensitivity (HOMA) for this period.

Analyzing diabetic patients (n=20) separately, a correlation of chemerin levels could be found with HOMA and HDL before surgery and with triglycerides 3 and 6 months after surgery. Differently in non-diabetic patients (n=37), chemerin correlates with BMI and IL-6 before surgery but not with HOMA or HDL.

Conclusion: This is the first study to demonstrate decreased chemerin plasma levels after bariatric surgery. The observed decrease in chemerin after bariatric surgery indicates together with our previous in vitro findings that chemerin might be a factor contributing to insulin resistance in obesity and the improvement of insulin sensitivity and other obesity-related morbidities after surgical intervention.

No conflict of interest

O-0051

Effects of obesity on ß-cell function in all stages of glucose tolerance

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In this study we analyzed the influence of obesity on insulin sensitivity and secretion throughout the different stages of glucose tolerance.

We recruited 1279 subjects (584 men and 695 women) who were stratified according to body mass index (BMI, kg/m^2), as normal weight (BMI < 25, n = 343), overweight (BMI ≥ 25 and < 30, n = 496) and obese (BMI ≥ 30,

n = 440). We executed a standard OGTT, measuring fasting and 2h-plasma glucose (FPG and 2hPG), to diagnose the different stages of glucose tolerance, and insulin (FPI and 2hPI) to evaluate ß-cell function. We calculated the estimated insulin sensitivity index (EISI) and the first phase of insulin secretion (1fsPH) as OGTT-derived values of insulin sensitivity and secretion, respectively. By OGTT, in agreement with the 2003 ADA criteria, we identified 713 normal glucose tolerant subjects (NGT), 256 affected by impaired fasting glucose (IFG), while 96 were affected by impaired glucose tolerance (IGT), 111 by combined IFG/IGT, and 103 were diabetics.
Within each glucose tolerance group, an ANOVA analysis and post-hoc comparison of ß-cell function variables was computed comparing the values obtained for each BMI range of values considered.
EISI consistently decreased proceeding from normal weight to obesity in each glucose tolerance group, except IGT. Closely associated with this finding, we found a significantly progressive increment of 1fsPH when proceeding from normal weight to obesity in all glucose tolerance stages.
Comparing subjects with similar BMI, but different glucose tolerance steps, both EISI and 1fsPH were significantly higher in NGT with respect to any glucose tolerance group.
Our data confirm that obesity is a metabolic condition where worsening of insulin sensitivity constitutes a common feature; this abnormality is also present in pre-diabetic stages and diabetes. The rise in insulin secretion attributable to obesity is however present not only in NGT but, surprisingly, in pre-diabetic stages as well as in diabetes.
This secondary rise in insulin secretion, when proportionate to insulin sensitivity, constitutes a distinctive feature of NGT; in the pre-diabetic stages and diabetes the significant rise of insulin secretion, that we measured in the present study, is not sufficient to compensate the concomitant worsening of insulin sensitivity.

No conflict of interest

O-0052

Low-grade inflammation and depressive symptoms as predictors of developing abdominal obesity

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Aims: Growing evidence shows that depression is a risk factor for cardiovascular disease and for the metabolic syndrome. Low-grade inflammation and evolving abdominal obesity have been hypothesized to be the underlying mechanisms linking these impairments of health. We therefore examined the effect of both depression and inflammation in developing abdominal obesity.
Methods: In this prospective study we investigated the relationship between inflammation and depressive symptoms and increased waist girth in 1725 non-diabetic middle-aged men participating in the Kuopio Ischemic Heart Disease Study during an 11-year follow-up. Inflammation was defined as serum C-reactive protein over 2mg/ml and depressive symptoms were assessed by Human Population Laboratory Depression scale. These two variables were combined together for logistic regression analysis.
Results: This study showed that men with both low-grade inflammation and elevated depressive symptoms were at an especially high risk to develop abdominal obesity (waist girth = 94 cm, OR 3.43, 95% CI 0.99-11.85, P<0.001; waist girth >102 cm, OR 4.33, 95% CI 1.68–11.19, P=0.004) during the 11-year follow-up, even after controlling for age, smoking, alcohol consumption, cardiovascular disease, physical activity and socioeconomic status. Similarly, these men were at a high risk for developing the metabolic syndrome (National Cholesterol Education Program definition, OR 3.90, 95% CI 1.37-11.12, P=0.002).
Conclusion: Inflammation together with elevated depressive symptoms may have especially adverse effects on metabolic risk factors in the long term, predisposing to abdominal obesity and the metabolic syndrome.

No conflict of interest

O-0053

Depot-specific expression of MMIF, MCP-1 and MIP-1alpha in human adipose tissue in relation to systemic inflammation

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Background: The systemic inflammation observed in obesity is thought to be mainly derived from the stroma-vascular fraction of adipose tissue (AT) due to macrophage-infiltration of AT in obesity. Macrophages are recruited and trapped in AT by release of chemoattractant-molecules such as monocyte-chemoattractant-protein-1 (MCP-1), macrophage-inflammatory-protein-1(MIP)-alpha and macrophage-migration-inhibitory-factor (MMIF). Whilst little is known about the contribution of chemokines to obesity-related inflammation, the aim of this study was to determine the depot-specific-expression of these chemokines in both subcutaneous and visceral AT and their association with circulating inflammatory cytokines which are typically elevated in obesity.
Methods: With ethical approval, a fasting blood sample, visceral-AT (VAT) and subcutaneous-abdominal-AT (SCAT)-biopsies were obtained from morbidly obese non-diabetic subjects undergoing bariatric surgery (age=44.5±1.4years (mean±SE), BMI=46.8±1.9kg/m^2, n=37) and age-matched lean controls undergoing elective surgery (age=42.3±4.1years, BMI=23.6±0.8kg/m^2, n=18). Chemokine plasma levels were determined by ELISA and AT-derived mRNA expression by quantitative real-time-PCR after correcting for ß-actin.
Results: In our study population we observed the following systemic cytokines were positively correlated with fat mass: hsCRP(r=0.82, p<0.001), solubleTNFalphaR2 (r=0.36, p<0.01) and IL-6 (r=0.52, p<0.001). There was no depot-specific AT-expression of TNFalpha or CD14. However, MCP-1, MIP-1alpha and IL-6 showed higher expression in SCAT (p<0.001) than VAT, whilst MMIF was higher in VAT (p<0.001). VAT-MMIF but not SCAT-MMIF correlated with fat mass (r=0.28, p<0.01), hsCRP (r=0.35, p<0.01) and HOMA-IR (r=0.2, p<0.05) independent of fat mass. In contrast, AT-MCP-1 was unrelated to hsCRP or HOMA-IR but plasma levels of MCP-1 showed a marked correlation with hsCRP (r=0.36, p<0.01). AT-MIP-1 was related to fat mass, and hsCRP and AT-MIP-1 showed a positive correlation with HOMA-IR (VAT: r=0.1, p<0.05; SCAT: r=0.3, p<0.01). AT-expression of MIP-1 also correlated with circulating solubleTNFalphaR2 (VAT: r=0.28, p<0.001; SCAT: r=0.17, p<0.001) and VAT-MIP-1alpha (r=0.28, p<0.01) but not SCAT-MIP-1alpha correlated with plasma IL6. In addition, VAT-TNFalpha (r=0.35, p<0.01) showed a stronger association to hsCRP than SCAT-TNFalpha (r=0.13, p<0.05).
Conclusion: Our data suggests that inflammatory cytokines and chemokines differ in their expression in the AT-depots. VAT-derived MMIF and TNFalpha correlate closer to hsCRP, solubleTNFalphaR2 and IL-6 as markers of systemic inflammation which characterises the obese state. This supports a major role of VAT-derived products in systemic inflammation. However, whilst SCAT may contribute less to systemic inflammation, the SCAT-MIP-1 correlation with HOMA-IR shows that some chemoattractants in SCAT may be independently associated with insulin resistance.

No conflict of interest

O-0054

Imaging the brain's response to eating in man using continuous arterial spin labelling functional magnetic resonance imaging

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Background: Dysregulation of appetite and satiety sensing can result in overeating, obesity and Type 2 diabetes. Central control of appetite is an attractive target for weight-reducing and insulin sensitising therapies. Conventional neuroimaging methods avoiding radiation exposure such as functional magnetic resonance imaging (fMRI) cannot easily be applied to measure regional brain responses to slowly evolving stimuli, such as eating. Continuous arterial spin labelling (CASL) is a method of quantifying changes in regional brain perfusion, a surrogate marker of neuronal activation, which may be applicable to the study of responses to feeding.
Methods: Ten R-handed healthy volunteers (age 26.2±3.1 yrs, BMI 24.1±1.7) were scanned twice using CASL (1.5T MRI scanner) in random order after an 8 hour fast and either a 400Kcal mixed meal or 50ml water (fasted control). CASL was measured before, immediately, 8 and 28 mins after ingestion. Imaging data were analysed using SPM5 (Wellcome Trust Centre for Neuroimaging, UK), comparing the fed and fasted states. Only significant clusters ($p < 0.05$ at the cluster level) were considered. Satiety scores were measured with each CASL measurement.
Results: Food ingestion increased satiety scores ($p<0.0001$); while hunger and desire to eat scored more highly in the fasted state ($p<0.001$, $p<0.0004$). There were no significant differences in the baseline CASL between the 2 study days. The fed state increased perfusion in the thalamus; hypothalamus; precuneus; superior and lateral cerebellum; visual and auditory cortices and the gustatory cortex associated with taste sensation in tongue and lips. Perfusion was less after food in the anterior cingulate and orbitofrontal cortices.
Conclusion: Food ingestion alters neuronal activation in regions known to be involved in appetite control and satiety sensing, nutrient sensing and taste. CASL provides a robust assessment of these responses and can be exploited in the examination of the role of appetite control in the pathogenesis and treatment of obesity and Type 2 diabetes.

No conflict of interest

O-0055

Insulin-mediated cortical activity in the slow frequency range is diminished in obese mice, and therefore promotes physical inactivity

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Aims: There is sufficient evidence from mouse models and humans that alterations in insulin action in the brain are accompanied by an obese phenotype; however, the impact of insulin in the brain with regard to behavioural aspects like locomotion is unknown.
Methods: To address insulin action in the brain with regard to cortical activity in distinct frequency bands and their behavioural consequences, the insulin signaling pathway was followed from the receptor up to electrical activity, and locomotion. Western Blot analysis, electrocorticogram recordings with intracerebroventricular (icv) application of insulin, and measurements of locomotor activity were performed in lean and obese, as well as Toll-like receptor (TLR) 2/4-deficient mice.
Results: We show that insulin application icv into lean mice was accompanied by a profound increase in cortical activity in the slow frequency range, while diet-induced obese mice displayed insulin resistance. In parallel, insulin icv increased locomotor activity in lean, whereas a PI 3-kinase inhibitor or obesity abolished insulin-mediated locomotion. A potential candidate that links insulin signaling to locomotion is the Kv1.3 channel that is activated by PI 3-kinase, and pharmacological inhibition of Kv1.3 channels bypassing insulin receptor activation promoted activity in lean and obese mice. Moreover, mice deficient in TLR2/4-dependent free fatty acid signaling displayed an increase in cortical activity in the slow frequency range that was correlated with improved spontaneous locomotor activity.
Discussion/conclusion: Our data provide functional evidence for a direct effect of insulin on brain activation patterns associated with locomotor activity in lean, while in obese, insulin-mediated locomotion is blunted and further aggravates physical inactivity.

No conflict of interest

ORAL PRESENTATION

CLINICAL RESEARCH

Hypoglycemia in diabetes

O-0056

Admission hypoglycaemia portends a substantially increased risk of mortality in patients with community-acquired pneumonia: population-based cohort study

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Aims: The relationship between dysglycemia and adverse events for hospitalized patients focuses on elevated blood glucose. Our aim was to examine the independent association between admission hypoglycemia and in-hospital, 30-day, and 1-year mortality in a population-based cohort of patients hospitalized with community acquired pneumonia (CAP).
Methods: From 2000 to 2002, clinical and laboratory data were prospectively collected on all CAP patients admitted to 6 hospitals in Edmonton, Alberta, Canada. Patients with admission glucose > 6.1 mmol/L (n=1996) were excluded from further consideration; the remaining 956 patients were categorized as having admission hypoglycemia (<4.0 mmol/L [n=54]) or normoglycemia (4.0 to ≤ 6.1 [n=902]). Multivariable Cox-proportional hazards models were used to examine the relationship between admission hypoglycemia and all-cause mortality after adjustment for demographic and clinical data (e.g. laboratory findings, comorbidities, functional status, pneumonia severity [PSI]). Examining in-hospital mortality, several further sensitivity analyses were undertaken: a) inclusion of clinical markers of physiologic stress [e.g. HR, Temp, RR]; b) exclusion of patients admitted to the ICU; c) exclusion of patients with known diabetes.
Results: Mean age of the 956 study patients was 65 (SD 20) years, 48% were female, and 15% resided in a nursing home. Most (45%) patients had severe (PSI Class IV or V) pneumonia. Overall, admission hypoglycemia was present in 2% (54 of 2990) of the entire cohort, and in 6% of our study sample (i.e., those with admission glucose ≤ 6.1 mmol/L). There were a total of 89 (9%) in-hospital deaths, 96 (10%) deaths at 30 days, and 247 (26%) deaths at 1 year. In-hospital mortality was higher among patients with admission hypoglycemia [11 (20%) deaths] compared to those with normoglycemia [78 (9%); adjusted hazards ratio (aHR) 2.96, 95%CI 1.38-6.31, p=0.005]. An increased risk of mortality was still observed at 30-days [11 (20%) vs. 85 (10%); aHR 2.88, 1.32-6.27] and remained elevated at 1-year [16 (30%) vs. 128 (14%); aHR 1.80, 1.02-3.17]. None of the sensitivity analyses undertaken altered our main findings with respect to in-hospital mortality: a) inclusion of markers of physiologic stress (aHR 3.30, 1.47-7.43); b) exclusion of 88 patients admitted to ICU (aHR 4.60, 1.88-11.27); c) exclusion of 72 patients with prior diabetes (aHR 2.97, 1.25-7.03). Furthermore, there was no indication of effect-modification by diabetes status (p>0.4 for interaction).
Conclusion: In a population-based sample of CAP patients without elevated blood sugars, we found that admission hypoglycemia was significantly associated with an increased risk of death during hospitalization that persisted up to 1-year. Although uncommon, admission hypoglycemia is easily identified and captures a group of patients at very high risk of adverse events that may need far greater clinical attention.

No conflict of interest

O-0057

Patients with increased glycemic variability measured using 2 days of continuous glucose monitoring have an increased risk of subsequent hypoglycemia

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Background: Continuous Glucose Monitoring (CGM) is increasingly being used to characterise glycemic variability within an individual as this may have bearing on risk of vascular complications as well as future hypoglycemia risk. Glycemic variability derived from a month of home glucose monitoring has been shown to predict risk of severe hypoglycemia in the following 3 months. It is not known if shorter (48 hours) exposure to more detailed glucose information available with continuous glucose monitoring(CGM) has similar predictive value. There are a number of different measures of glycemic variability and it is not clear which offers the best assessment of an individual's risk of subsequent hypoglycemia.
Aims: To determine if patients with greater glycemic variability measured using a single sensor (48 hours of data) are at higher risk of hypoglycaemia over the subsequent 9-12 months.
Methods: We analysed the first complete 48 hours of CGM data from 75 patients with type 1 diabetes from the UK Hypoglycemia Study [Mean HbA1c 7.6 (0.9) %; Diabetes duration either <5 years or >15 years] and calculated measures of glycemic variability [Low Blood Glucose Index(LBGI), High Blood Glucose Index(HBGI, Blood Glucose Risk Index(BGRI) and Continuous Overall Net Glycemic Action (CONGA). Each patient also recorded all symptomatic hypoglycemia over the subsequent 9-12 months. We correlated measures of variability and subsequent hypoglycemia risk.
Results: Glycemic variability was greater in patients with longer duration of diabetes and was significantly correlated with HbA1c (CONGA 1, r = 0.35; p=0.003). CONGA and BGRI showed good correlation with each other (r= 0.69; p<0.001) but there was poor agreement between those in the highest quartile of variability measured by both methods (Kappa = 0.3). LBGI calculated from 48 hours of CGM was not correlated with risk of subsequent hypoglycemia, but CONGA 1 was significantly correlated with risk of severe hypoglycemia (r=0.3; p=0016) and symptomatic hypoglycemia (r= 0.4; p<0.001) over the next 9-12 months. There was also a significant correlation between CONGA 1 and capillary glucose readings <3.5 mmol/l (r= 0.4; p<0.001). CONGA 1 >30 predicted increased risk of severe hypoglycemia over the following year.
Conclusion: Patients with increased glycemic variability (measured using short term CGM data) are at increased risk of subsequent symptomatic and severe hypoglycemia over the subsequent 9-12 months. This may allow us to identify more appropriate treatment strategies for these individuals. There is poor agreement between measures of variability and more work needs to be done to evaluate these measures.

Conflict of interest:
Paid lecturing: P Choudhary, S Heller, S Amiel
Advisory board: S Amiel

O-0058

Estimating number-needed-to-treat to avoid hypoglycaemic episodes in people with type 2 diabetes: a post-hoc analysis of a prospective randomized controlled trial comparing once-daily insulin glargine with twice-daily NPH insulin

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Aims: Studies consistently show that insulin glargine (Glargine) is associated with less risk of hypoglycaemia for a given level of blood glucose (BG) than NPH, especially when close to glycaemic targets. To quantify the potential value of hypoglycaemia risk reduction with the use of Glargine, we reviewed data from a large, long-term study to determine the number of people that need to be treated (NNT) with Glargine vs NPH to protect 1 person from experiencing hypoglycaemia.
Methods: Hypoglycaemia and HbA_{1c} data from a 5-yr study that compared randomized treatment with Glargine qd (evening) or NPH bid (morning and evening), both with oral antidiabetic drugs (OADs), to assess retinopathy progression (reported elsewhere) in patients with Type 2 diabetes (T2D) were included. Patients received basal insulin plus OADs, prandial regular insulin could also be added. 1017 participants previously using insulin for T2D were enrolled (mean age 55 yr, T2D duration 11 yr, BMI 34kg/m^2, HbA_{1c} 8.4%). Stable control of HbA_{1c} was achieved with each basal insulin throughout the study. Hypoglycaemia risks adjusted for change in HbA_{1c} were derived by logistic regression (498 Glargine and 486 NPH patients). The NNT was computed for the following categories of hypoglycaemia: severe (predefined in study), symptomatic with SMBG <36 and symptomatic with SMBG <70mg/dL.
Results: For Glargine qd and NPH bid, total basal insulin dose was 61.8 and 72.3U and HbA_{1c} change was –0.62 and –0.73%, respectively. Compared with NPH, Glargine was associated with a significantly lower risk for all categories of daytime and total but not nocturnal hypoglycaemia. These reduced risks translated into statistically significant and, in most cases, clinically relevant NNT values (<20). Differences in rates of nocturnal hypoglycaemia did not reach statistical significance.
Summary: Glargine qd results in a lower incidence of total and daytime hypoglycaemia than using NPH bid. The NNT to avoid 1 person experiencing an event ranged 13–30 for different categories of total and daytime hypoglycaemia. The NNT for severe hypoglycaemia was 23.
Conclusion: The reduced risk of hypoglycaemia by using Glargine instead of NPH insulin in this population was clinically relevant in terms of NNT.

Patient number	Glargine/NPH 498/486	
Hypoglycaemia type	NNT (95% CI)	p value
Total (all symptomatic)*	20 (10, 353)	0.0382
Severe†	23 (13, 168)	0.0232
Symptomatic (<36mg/dL)‡	15 (8, 104)	0.0226
Symptomatic (<70mg/dL)§	17 (9, 124)	0.0242
All day time	14 (8, 66)	0.0132
Severe†	30 (16, 192)	0.0207
Symptomatic (<36mg/dL)‡	13 (8, 41)	0.0042
Symptomatic (<70mg/dL)§	15 (8, 78)	0.0165
All nocturnal	25 [−∞, −45]∪[10, +∞]	0.2036
Severe†	84 [−∞, −56]∪[24, +∞]	0.4297
Symptomatic (<36mg/dL)‡	36 [−∞, −41]∪[13, +∞]	0.2922
Symptomatic (<70mg/dL)§	25 [−∞, −45]∪[10, +∞]	0.2036

*Irrespective of time of day and SMBG values; †defined in study; ‡2.00mmol/L; §3.89mmol/L

Conflict of interest:
Paid lecturing: V Fonseca has received honoraria for lecturing and consultancy from GlaxoSmithKline, Novartis, Takeda, Pfizer, sanofi-aventis and Eli Lilly.
Employee: M-P Dain is an employee of sanofi-aventis.
Commercially-sponsored research: V Fonseca has received research support (to Tulane University) from GlaxoSmithKline, Novartis, Novo Nordisk, Takeda, AstraZeneca, Pfizer, sanofi-aventis, Eli Lilly, Daiichi-Sankyo, NIH and ADA.
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O-0059

Fear of hypoglycaemia in adults with type 1 diabetes and its relation to demographic and disease specific factors

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Aims: It has been reported that fear of hypoglycaemia (FoH) is as strong as fear of vascular complications among patients with type 1 diabetes. Furthermore, FoH affects quality of life and may also have a negative impact on metabolic control. The aim of this study was to examine the FoH in adult patients with type 1 diabetes and to investigate its association with demographic and disease specific factors.

Methods: Questionnaires were sent by mail to all patients with type 1 diabetes identified in the local diabetes registries of two hospitals in Stockholm, Sweden (n=1347). FoH was measured using the Hypoglycaemia Fear Survey (HFS); the worry-subscale and the aloneness-subscale (measuring fear of aloneness) from the Swedish version of HFS. Demographic and disease specific factors were collected from patients self reports and medical records and included gender, age, duration of diabetes, HbA_{1c}, self monitoring of blood glucose, frequency of severe, moderate and minor hypoglycaemia, symptoms during hypoglycaemia, history of hypoglycaemic unawareness and self reported episodes of "hypoglycaemic symptoms" during hyperglycaemia. Univariate analysis and multiple stepwise linear regression analysis were used in the statistical analysis.

Results: 764 patients participated in the study, 380 men and 384 women, mean age 43.3 years and mean HbA_{1c} 7.0% (normal < 5%). The HFS worry-subscale was significantly associated with frequency of severe hypoglycaemia, frequency of symptoms during minor hypoglycaemia, gender, "hypoglycaemic symptoms" during hyperglycaemia and unawareness of hypoglycaemia, The HFS aloneness-subscale was significantly associated with frequency of severe hypoglycaemia, frequency of symptoms during minor hypoglycaemia, gender, frequency of minor hypoglycaemia, HbA_{1c}, unawareness of hypoglycaemia and visits to hospital due to severe hypoglycaemia. Separate analyses for gender showed that FoH was more prevalent in females and also indicated a somewhat different pattern of factors associated with FoH with fewer significant factors for males than for females.

Conclusion: Our results confirm previous research which identifies the frequency of severe hypoglycaemia as the most important factor associated with FoH. In addition, gender and hypoglycaemic unawareness, "hypoglycaemic symptoms" during hyperglycaemia and HbA_{1c} were identified as significant factors predicting FoH. To our knowledge this is the first study to document gender differences with respect to FoH. This indicates the need of further research.

No conflict of interest

O-0060

Fears of hypoglycaemia and complications in insulin-treated patients with diabetes: preliminary results of a multi-center study

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Diabetic patients regarding insulin treatment seem to have many kinds of fear in their daily lives. Especially, fears of hypoglycemia and diabetic complications are considered major concerns. This study investigated which of these fears: hypoglycemia, severe hypoglycemia, blindness, or dialysis is most severe in insulin-treated type 1 and type 2 patients based on responses obtained from a multi-center cross-sectional survey. By the end of February 2008, 554 patients and their physicians at the outpatient department of 15 hospitals or clinics had completed the questionnaire. The response rate was 75%. We developed this original questionnaire to survey the occurrence of hypoglycemia (including severe and nocturnal hypoglycemia); fears of hypoglycemia, severe hypoglycemia, blindness, dialysis; and socio-demographic factors. The strength of fear was measured using a 5-point Likert scale with 1 never feel fear, and 5 feel extreme fear. In this study, severe hypoglycemia was defined as a low blood glucose level that results in a loss of consciousness or requiring the treatment from another person. There were 554 subjects (193 type 1 and 361 type 2, mean age 57 years, male 52%, mean duration of diabetes 16.9 years, mean duration of insulin therapy 7.3 years, and mean HbA1c 7.3%). Fear scores were 3.7 for hypoglycemia, 4.3 for severe hypoglycemia, 4.7 for blindness, and 4.7 for dialysis on a scale of 1 to 5. One way analysis of variance showed that there was no significant difference between the fears of blindness and dialysis. However, there was a significant difference between fears of complications and severe hypoglycemia ($p<0.05$). There was also a significant difference between severe hypoglycemia and hypoglycemia ($p<0.05$). Additionally, using logistic regression analysis, two factors such as an experience of severe hypoglycemia in the past year and age were significantly associated with an increased likelihood of fear of hypoglycemia (odds ratio = 3.5 and 1.0, respectively). Other factors such as gender, type of diabetes, duration of diabetes, presence of diabetic neuropathy and level of HbA1c were not significantly associated with fear of hypoglycemia. In conclusion, insulin treated patients with diabetes had stronger fears of complications than of hypoglycemia (blindness = dialysis > severe hypoglycemia > hypoglycemia). Experience with severe hypoglycemia in the past year was a major factor affecting fear of hypoglycemia. Thus, it seems to be important to take various measures to reduce the incidence of severe hypoglycemia.

No conflict of interest

O-0061

The costs and main causes of severe hypoglycemia in diabetic patients visiting the emergency room

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Background and aims: The risk of hypoglycemia is a barrier to intensive diabetes management. If the patient can recognize the hypoglycemia early and deal with it properly, the risk of severe hypoglycemia can be reduced. We performed this study to identify the main factors causing severe hypoglycemia in diabetes patients and treatment costs, when they came to ER.
We also evaluated the patients' or families' capabilities to manage the situation.

Methods: The patients with diabetes mellitus who visited ER of a university hospital with severe hypoglycemia (n = 34) were enrolled for 15 months. Emergency nurse specialists conducted interviews on the patient and family member while a diabetes clinical nurse specialist reviewed the medical record. The interview was based on the questionnaires dealing with various aspects of causes of hypoglycemia and self management (skills) and knowledge of hypoglycemia. We also checked the medical costs when they were discharged.

Results: The average age of the subjects was 68.3±11.0 years(range 36-84yrs, median 69.5yrs). Among the patients, 88.2% (n=30) were taking oral hypoglycemic agent (OHA) and 44.1% (n=15) were taking insulin. The most frequent cause of severe hypoglycemia was irregular eating (85.1%, n=29) with or without overdose of OHA or insulin.
The 55.9% (n=19) of the subjects never had a diabetes education before. Only 12.1% (n=4) of patients or families checked blood glucose level when they were attacked by hypoglycemia at home. Even though they did not check blood glucose at the time of the incident, 42.4% (n=14) tried to eat something sweet. The total medical cost was 212.1(±151.1) US dollar, which was 6.9-fold higher than the average cost of OPD visit.

Conclusion: This study emphasized the importance of regular meal plan to prevent hypoglycemia. Patients and their families should be taught to check the blood glucose level regularly when their food intake becomes irregular. This should reduce the medical costs associated with visiting ER due to severe hypoglycemia.

No conflict of interest

O-0062

Determinants of severe hypoglycaemia in community-based patients with type 2 diabetes: the Fremantle Diabetes Study

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Aim: To determine the incidence and predictors of severe hypoglycaemia (SH) in community-dwelling Australians with type 2 diabetes using robust analytical techniques, including those that account for the majority who should not experience SH.
Methods: We studied 616 FDS type 2 patients from the longitudinal observational Fremantle Diabetes Study (FDS) who were assessed in detail in 1998 and followed to end-June 2006 for episodes of severe hypoglycaemia (SH). SH was defined as that requiring i) ambulance attendance, ii) Emergency Department (ED) services, or iii) inpatient care. Cox proportional hazards modelling was used to determine independent predictors of the first SH episode. Poisson, negative binomial (NB), zero-inflated Poisson (ZIP) and zero-inflated negative binomial (ZINB) regression models were used to identify predictors of SH frequency.
Results: The patients had a mean (±SD) age of 67.0±9.8 years, 52.3% were male and they had been diagnosed a median [inter-quartile range] of 7.7 [5.2-11.8] years previously. Their median HbA1c was 7.2 [6.5-8.1]% and 13.2% were insulin-treated. A total of 104 (9.3%) experienced at least one episode of SH during 7,172 patient-years (mean 6.4±2.1 years) of follow-up with an incidence of 2.5/100 patient-years. The average number of SH events was 1.7 (range 1 to 20). Independent predictors of time to first SH event were insulin treatment (hazard ratio [95% confidence interval] 4.61 [2.60-8.17]; P<0.001), estimated glomerular filtration rate (eGFR) <60 ml/min/1.73m^2 (2.93 [1.69-5.07]; P<0.001) and educational attainment beyond primary level (2.38 [1.10-5.12]; P=0.027). The ZINB provided the best fit of the four models of SH frequency tested. SH frequency was associated with a lower fasting serum glucose (FSG; relative risk 0.86 [0.76-0.98] for a 1 mmol/L increase) and a higher HbA1c (1.32 [1.01-1.75] for a 1% increase), while patients who did not experience SH were unlikely to use insulin (0.06 [0.01-0.40]) or to have an eGFR <60 ml/min/1.73m^2 (0.21 [0.09-0.53]).
Conclusions: Insulin treatment is the strongest risk factor for SH in community-based type 2 diabetic patients. Renal impairment is also an independent predictor, while higher educational attainment might predispose to SH through greater knowledge of the implications of poor glycaemic control and consequently more intensive self-management. Although the relationship between SH frequency and a lower FSG is understandable, that with a higher HbA1c may identify a group of patients with unstable control including unpredictable SH.

Conflict of interest:
Other substantive relationships: T M E Davis received an unrestricted educational grant from Sanofi-Aventis which supported this study

O-0063

Maternal characteristics and neonatal outcome of children born to mothers with Type 1 Diabetes who experienced severe hypoglycemia during pregnancy.

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Severe hypoglycemia (SH) can occur in about half of pregnancies complicated by type 1 diabetes (T1D). As part of a longitudinal study examining the impact of SH during pregnancy on the neurodevelopmental outcome of the offspring, we explored characterisitcs of mothers affected by SH during pregancy and their neonates.
Aims: 1) To compare the diabetes characteristics of mothers with T1D affected by SH during pregnancy to mothers with T1D without SH 2) to compare the neonatal outcomes of the offspring of mothers with T1D affected by SH during pregnancy, to mothers with T1D without SH and healthy control mothers.
Methods: Pregnant women with T1D were recruited early in pregancy and information on their diabetes history, general health history and habits and demographic information was collected. Diabetes control information such as A1C, SH, frequency of mild hypoglycemia and insulin doses was gathered prospectively throughout their pregancies. Information on the neonatal outcomes of the offspring was collected through maternal interviews and chart review.
Results: 53 pregnant women with T1D (23 with at least one episodes of SH during pregancy and 30 without SH) and 52 control women and their offspring were included in this analysis. There were no differences between T1D mothers with SH and those without SH in terms of age, educational level, marital status, age at diagnosis, duration of diabetes, A1C at first antenatal visit or presence of microvascular disease. However, a history of 2 or more episodes of SH in the 12 months prior to pregnancy was associated with a threefold increased risk of SH during pregnancy (p<0.001). Insulin doses, frequency of mild hypoglycemia, weight gain and A1C throughout the pregnancy did not differ between the two diabetes groups. Mothers with T1D had higher rates of cesarian and induced delivery than the control group (p<0.005). Neonates born to both groups of mothers with T1D were more likely to have at least one blood glucose < 2.0 mmol/l and/or be admitted to NICU for hypoglycemia than the control group (p<0.01). No differences in terms of birth weight, gestational age, Apgar at 5 minutes, and neonatal complications were found among the 3 groups.
Discussion/conclusion: Women with 2 or more episodes of SH in the 12 months prior to becoming pregnant are at higher risk of SH during pregnancy. Women with T1D and at least one episode of SH during pregnancy were no different from the other women with T1D or women without diabetes in terms of maternal demographic characterisitcs, other diabetes control indices and health history factors. The occurrence of SH during pregnancy does not impact immediate neonatal outcome compared to the effects of diabetes alone.

No conflict of interest

ORAL PRESENTATION

FOUNDATION SCIENCE

Molecular regulation of the ß-cell function and survival

O-0065

Adipose triglyceride lipase is implicated in fuel and non-fuel stimulated insulin secretion

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Reduced lipolysis in hormone-sensitive lipase (HSL)-deficient mice is associated with impaired glucose-stimulated insulin secretion (GSIS), suggesting that endogenous ß-cell lipid stores provide signalling molecules for insulin release. Measurements of lipolysis and triglyceride (TG) lipase activity in islets from HSL$^{-/-}$ mice indicated the presence of other TG lipase(s) in the ß-cell. Using RT-QPCR, adipose triglyceride lipase (ATGL) was found to be the most abundant TG lipase in rat islets and INS832/13 cells. To assess its role in insulin secretion, ATGL expression was decreased in INS832/13 cells (ATGL-KD) by small hairpin RNA. ATGL-KD increased the esterification of free fatty acid (FFA) into TG. ATGL-KD cells showed decreased glucose- or Gln + Leu-induced insulin release, as well as reduced response to KCl or palmitate at high, but not low, glucose. The KATP/amplification pathway of GSIS was considerably reduced in ATGL-KD cells. These data in ATGL-KD cells were confirmed by using a transgenic mouse lacking ATGL. ATGL$^{-/-}$ mice were hypoinsulinemic, hypoglycemic, and showed decreased plasma TG and FFAs. A hyperglycemic clamp revealed increased insulin sensitivity and decreased GSIS and arginine induced insulin secretion in ATGL$^{-/-}$ mice. Accordingly, isolated islets from ATGL$^{-/-}$ mice showed reduced insulin secretion in response to glucose, glucose + palmitate and KCl. Islet TG content and FFA esterification into TG were increased by 2 fold in ATGL$^{-/-}$ islets, but glucose usage and oxidation were unaltered. The results demonstrate the importance of ATGL and intracellular lipid signalling for fuel and non-fuel induced insulin secretion.

No conflict of interest

O-0066

AMPK activity in pancreatic ß-cells and in insulin-expressing neurons regulates ß-cell mass, glucose-regulated insulin secretion and glucose homeostasis

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Aims: AMP-activated protein kinase (AMPK) is a key regulator of cellular energy metabolism and a drug target for metformin and thiazolinediones. Whilst changes in AMPK activity in liver and muscle regulate blood glucose directly, hypothalamic AMPK is involved in the central control of glucose homeostasis. Here, we explore the effects of forced-changed AMPK activity in pancreatic beta cells and insulin expressing neurons, in vivo, using transgenic and knockout mice for AMPK.
Methods: Transgenic mice expressing constitutively-active (AMPK CA) or dominant-negative (AMPK DN) forms of AMPK under the control of a 0.6 kb proximal fragment of the rat insulin promoter 2 (RIP2) promoter were generated. Whole body knock out mice for AMPK alpha1 catalytic subunit were crossed with mice carrying a floxed allele of the AMPK alpha2 catalytic subunit and subsequently bred with animals carrying Cre recombinase under the RIP2 promoter to generate RIP-AMPKa2$^{-/-}$/a1$^{-/-}$ mice.
Mice underwent intraperitoneal glucose tolerance test (IPGTT) using 1 g/kg body weight for measurement of blood glucose (Roche, Accuchek glucometer) or 3 g/kg body weight for measurement of plasma insulin (Merchodia, ultrasensitive rat insulin ELISA). Intraperitoneal insulin tolerance tests (IPITT) were performed using 0.75U bovine insulin/kg mouse weight. Glucose-induced insulin secretion (GIIS) from isolated islets was measured after batch incubation with 3 or 16.7 mmol/l glucose. Secreted and total insulin were quantified by radioimmunoassay using I^{125}-labeled insulin. All experiments were approved by UK Home Office according to Animals (Scientific Procedures) Act, 1986.
Results: Male RIP-AMPK CA mice displayed glucose intolerance at 12 weeks (AUC for transgenic, 13.3 ± 0.4 vs. 11.6 ± 0.3 x 10^2min.mmol/L for controls; n=9; mean ± SEM) and 25 % lower ß-cell mass (0.68 ± 0.05 % vs. 0.9 ± 0.04% pancreatic surface in controls, $p < 0.05$, n=3 mice per genotype). Isolated islets from RIP-AMPK CA mice displayed 20 % increase in AMPK activity at 16.7 mmol/l glucose and GIIS (16.7 vs 3 mmol/l glucose) from these islets was reduced to 0.28 ± 0.03 %/ 30 min from 0.59 ± 0.13 %/ 30 min in controls; n =4, p = 0.03.
Whilst glucose tolerance and ß-cell mass were normal in RIP-AMPK DN mice, isolated islets displayed a 30 % decrease in AMPK activity at 3 mmol/l glucose. RIP-AMPKa2$^{-/-}$/a1$^{-/-}$ mice however, displayed grossly abnormal glucose tolerance (AUC for KO, 16.7 ± 0.70 vs. 12.4 ± 0.3 mmol/L for controls; n=3; mean ± SEM) and undetectable insulin secretion ***in vivo***. However, GIIS was normal in isolated islets and IPITT showed increased peripheral insulin sensitivity.
Conclusion: AMPK is indispensible in beta cells and insulin-expressing neurons for normal regulation of glucose homeostasis and insulin secretion, most likely through a central effect. However, sustained activation of AMPK in these tissues impairs insulin secretion and decreases beta cell mass.

No conflict of interest

O-0067

Augmented cycling of ß-cell triglyceride stores contributes to enhanced glucose-stimulated insulin secretion in PKCe null mice

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Aims: Deletion of protein kinase C epsilon (PKCe) has been shown to protect mice from high fat diet induced glucose intolerance by enhancing glucose stimulated insulin secretion (GSIS). The amplifying pathways of GSIS allow glucose to increase insulin secretion independently of the K^+ATP channel dependent triggering pathway. Lipid signalling processes such as lipid partitioning, lipolysis and lipid cycling have been implicated in modulating GSIS. Therefore, the aim of this study was to test the involvement of lipid signalling processes in the up-regulation of GSIS in PKCe knock-out (KO) islets.
Methods: Islets were isolated and cultured for 48 hours in DMEM containing 0.92% BSA coupled to 0.4mmol/l palmitate (lipid). Secretion experiments were performed by batch incubation in KRB containing either 2mmol/l or 20mmol/l D-glucose. Diazoxide (100µM) and KCl (25mM) were used to test the amplifying pathways of GSIS. Orlistat (200µM) was used to inhibit lipolysis. Lipid flux was assessed using [^{14}C]palmitate, [^{3}H]triglyceride and glycerol release. Statistical significance was determined by t-test.
Results: We detected an enhancement of GSIS (wt 334 ±42, PKCeKO 1086 ±218, pg/islet/hour, n=10, P<0.01) and amplifying pathway GSIS (wt 3794 ±385, PKCeKO 6206 ±689, pg/islet/hour, n=6, P<0.01) in lipid cultured PKCeKO islets. This enhancement of GSIS was associated with increased esterification of exogenous palmitate into triglyceride pools (wt 2778±184, PKCeKO 3602 ±185, ^{14}C counts per min, n=11, P<0.01), increased lipolysis (wt 247±30, PKCeKO 369 ±40, pmol glycerol released/150islets/hour, n=7, P<0.05) and increased triglyceride lipase activity (wt 733 ±31, PKCeKO 879 ±33, pmol substrate hydrolysed/mg protein/min, n=5, P<0.05). Inhibition of lipolysis by orlistat treatment of islets during secretion experiments completely normalised the enhanced GSIS (wt 357 ±58, PKCeKO 509 ±116, pg/islet/hour, n=9, ns) and amplifying GSIS (wt 4071 ±1070, PKCeKO 3734 ±617, pg/islet/hour, n=9, ns) in lipid exposed PKCeKO islets.
Discussion/conclusions: These data show that lipid cultured PKCeKO islets are a model of enhanced amplifying GSIS. The enhanced GSIS is coupled by enhanced lipolysis and correlates with increased triglyceride formation, indicating increased cycling of lipids through the triglyceride pool. Therefore we provide evidence for a lipid derived signal involved in GSIS coupling, and implicate PKCe in this process. As PKCeKO mice are protected from high-fat-diet-induced glucose intolerance, up-regulation of GSIS by inhibition of PKCe in humans may represent a potential novel treatment for type 2 diabetes.

No conflict of interest

O-0068

Knockout of Nck-1 in mice results in important loss of pancreatic islets but enhances beta cell insulin levels

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Pathogenesis of type 2 diabetes is characterized by pancreatic ß-cell dysfunction and apoptosis. A better understanding of the mechanisms regulating pancreatic ß-cell function is crucial to develop new strategies to prevent diabetes. Here, we report physiological evidence for an important role for the Src homology domain-containing adaptor protein Nck-1 in pancreatic islets homeostasis. Mice in which the Nck-1 gene has been deleted are smaller than their wild type littermate, but this difference disappears after three months of age. Five month old Nck-1 KO mice are virtually identical to the wild type mice in terms of body and individual tissues weights, and food consumption. Nck-1 KO mice also present normal blood glucose and insulin levels, and no noticeable change in insulin sensitivity in spite of impaired tolerance to glucose in glucose tolerance test ***in vivo***. Essentially, similar glucose intolerance has been observed in mice lacking Nck-2, an Nck isoform that shares about 68% identity with Nck-1. This suggests that both Nck adaptors could have a redundant role in modulating glucose tolerance in mice. Examination of the pancreatic islets reveals that Nck-1 KO mice harbor fewer and smaller pancreatic islets, but have normal architecture of a-cells surrounding a central core of ß-cells. Furthermore, no sign of apoptosis can be detected by TUNEL assay in Nck-1 KO mice pancreatic islets. Surprisingly, Nck-1 KO pancreatic islets contain significant higher levels of insulin and release insulin proportionally to their content ***in*** vitro, thus release higher levels of insulin in response to glucose stimulation. These findings suggest that decreased glucose tolerance in Nck-1 KO mice might not be due only to ß-cell defects. Additional investigations are underway to define the mechanism by which Nck adaptor proteins influence pancreatic islets homeostasis.

No conflict of interest

O-0069

GIP and GLP-1 normalize glucose tolerance by normalizing islet adaptation to insulin resistance without increasing glucose effectiveness in high-fat fed mice

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Aims: Insulin resistance is adaptively compensated by increase in insulin secretion and glucose effectiveness. However, these adaptations are inadequate in mice after high fat feeding that yields markedly reduced glucose elimination

after intravenous glucose. We investigated whether these defective adaptations can be normalized by the incretin hormones glucose-dependent insulinotropic polypeptide (GIP) and glucagon-like peptide-1 (GLP-1).

Methods: C57BL/6J mice were fed a normal chow (ND 11%) or a diet with 60% fat for 8 weeks (HD). After a baseline blood sample was taken, a bolus injection of glucose at 35 g/kg with or without addition of synthetic GIP or GLP-1 (at 0.03, 0.3 or 3 nmol/kg) was given intravenously followed by six blood samples taken within 50 (ND) or 75 min (HD) for analysis of glucose and insulin. Data were analyzed with minimal model that provides insulin sensitivity index (SI) and glucose effectiveness (SG). Insulin secretion was assessed as the increase in insulin levels during the first 5 min after injection (dAIR), and glucose elimination was estimated as the percent reduction of glucose (after logarithmic transformation) during the first 20 min after administration (K_G). ß-cell adaptation was calculated as SI×dAIR (disposition index, DI) and ß-cell function as delta peak insulin/delta peak glucose.

Results: K_G was lower in HD fed mice (P<0.001). At 0.03 nmol/kg, neither GIP nor GLP-1 significantly affected K_G in HD; at 0.3 nmol/kg, the incretins significantly increased K_G, but not to normal values. However, at 3 nmol/kg, K_G was completely normalized by both GIP (2.28±0.22, n=11) and GLP-1 (1.96±0.24, n=17). As can be seen in the Table, this was associated with markedly increased dAIR and ß-cell function (p<0.001); S_I was not affected, but the resulting DI was completely normalized. In contrast, S_G, which was increased by HD, was slightly reduced, but not normalized, by the incretins.

	ND (n=48)	HD (n=49)	HD with incretins (n=28)
Body weight (g)	22.1±0.2	35.6±0.9	36.6±1.2
K_G (% min^{-1})	1.96±12	1.35±0.10	2.10±0.20
S_I (min^{-1}/(pmol/l))	1.14±0.09	0.51±0.06	0.56±0.04
dAIR (pmol/l)	1096±69	594±64	2207±151
DI	12.8±1.3	2.8±0.4	12.7±1.2
S_G (min^{-1})	0.040±0.002	0.096±0.010	0.074±0.006
ß-cell sensitivity	134±9	69±7	273±26

Discussion: We conclude that GIP and GLP-1 completely normalize the glucose elimination in severe insulin resistance in mice after high-fat feeding by normalizing the disposition index; this derives from marked upregulation of the islet adaptation to insulin resistance without any effect on insulin sensitivity and with no improvement of insulin-independent mechanisms of glucose elimination.

No conflict of interest

O-0070

Angiotensin II type 1 receptor inhibition protects human islets from the effects of glucose on oxidative stress and angiogenesis

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Aim: Data from prospective studies suggest a significant reduction in the risk of type 2 diabetes after blockade of the renin angiotensin system (RAS). Since RAS has been found in pancreatic islets and the surrounding capillary network, we hypothesized that these beneficial effects could be attributed to direct actions on islet micro vessels. Our study examined the direct actions of glucose and the Angiotensin II receptor blocker Losartan on isolated human beta cells.

Methods: Human islets from 8 distinct donors were studied following 96 hrs in culture in presence of normal (5.5 mmol/l) or high (16.7 mmol/l) glucose concentrations with or without 5 µmol/l Losartan. The levels of specific gene transcripts were studied by real-time polymerase chain reaction and angiogenesis-related protein expression using protein arrays. Expression of CD31 were studied by indirect immunofluorescence and insulin secretion was monitored by IRMA.

Results: Insulin secretion was significantly increased by 8.5 times at 16.7 mmol/l glucose for 4 days when compared to 5.5 mmol/l glucose (55.4 ± 21.4 vs 13.5±11.5 mUI/L/prot (µg/ml), 8 independent islet preparations, p=0.006). Indirect immunofluorescence staining showed that glucose reduces the number of CD31+ endothelial cells. We found that high glucose had significant effects on angiogenic markers such as a decrease in VEGF mRNA and protein expression levels (20% and 64%, p=0.05 and $p=3.10^{-6}$, respectively). Protein arrays showed that high glucose reduced expression of additional factors such as IGFBP2 by 53% ($p=5.10^{-7}$) or IL8 by 24% (p=0.008). Gene expression of NADPH oxidase subunits (Nox2, NDUFa9) and NRF1 was not modified by high glucose; but Ros levels were significatively 60% up-regulated by high glucose (p=0.02). These effects of glucose on Ros levels were partially abrogated (Ros levels decreasing by 52%) by Losartan. Furthermore, Losartan was able to reverse effects observed on protein expression of some angiogenic markers. Indeed while glucose decreased protein expression of VEGF, IGFBP2 and IL8, Losartan partially tended to reverse VEGF reduction (25% reversal increase, p=0.08) and completely reversed reduction of IGFBP-2 (p=0.002) and IL8 (p=0.02).

Discussion/conclusion: These data suggest that glucose reduces islet angiogenesis, and increases oxidative stress. Blockade of islet RAS might prevent these modifications. These data may have important clinical consequences both for prevention of type 2 diabetes and islet preconditioning prior to cell transplantation. In perspective, we will study effects of glucose and Losartan on markers involved in mitochondrial and endoplasmic reticulum stress.

No conflict of interest

O-0071

TNF-[alpha] or IL-1ß induced nuclear factor-[kappa]B activation has a pro-apoptotic effect in pancreatic ß-cells

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Type 1 diabetes is characterized by the infiltration of inflammatory cells into pancreatic islets, followed by the selective and progressive destruction of insulin-secreting ß-cells. Apoptosis has been proposed to be the main form of ß-cell death at the onset of T1D and following islet transplantation. Cumulative evidence suggests that the pro-inflammatory transcription factor NF-kB (nuclear factor[kappa]B) could be an important cellular signal in initiating a cascade of events that leads to ß-cell death. To investigate the role of NF-kB in the destruction/survival of ß-cells, the transgenic mouse line TolB (for Tet-on delta I[kapp]B in ß-cells) was generated. In these mice, NF-kB activation is specifically inhibited in ß-cells by the expression of a non-degradable IkB transgene ([delta]NIkBa) in an inducible and reversible manner using the ***tet-on*** gene regulation system. We show that, inhibition of the NF-kB pathway protects isolated islets from cytokine-induced apoptosis ***in vitro,*** and from multiple low doses streptozocin induced diabetes ***in vivo,*** along with reduced intra-islet lymphocytic infiltration.

Aims: To further study the role of the different cytokines IL-1ß, TNF-[alpha] and IFN-[gamma], in inducing ß-cell death or survival. The principal aim is to resolve the controversial issue of NF-kB activated by TNF-a which leads to ß-cell survival.

Methods: Islets isolated from TolB mice were treated with TNF-a (100U/ml), IL-1ß (50 U/ml) or INF-g (1000 U/ml) in the presence or absence of doxycycline which turns on the [delta]NIkBa transgene. We then assessed the NF-kB nuclear translocation by EMSA, nitric oxide (NO) production using Greiss assay, apoptosis evaluated by TUNEL assay and target gene expression by real time RT-PCR.

Results: Exposure to IL-1ß +IFN-g or TNF-a + IFN-g induced NF-kB nuclear translocation, NO production and ß-cell apoptosis. NO production, apoptosis and NF-kB target gene induction where significantly more prominent after exposure to IL-1ß +IFN-g than to TNF-a + IFN-g. Induced islets expressing the [delta]NIkBa protein were resistant to the deleterious effects of both IL-1ß +IFN-g and TNF-a + IFN-g.

Conclusion: Our results show that NF-kB activation is pro-apoptotic in ß-cells when induced either by IL-1ß or TNF-a in combination with IFN-g. Furthermore, this pro-apoptotic effect is more robust after IL-1ß exposure perhaps due to a sustained activation of NF-kB and to the pattern of expression NF-kB target genes. These results underscore the key role played by NF-kB in ß-cell destruction. The effects of temporal NF-kB blockade in the survival of ß-cells in transplanted islets expressing the [delta]NIkBa inducible transgene, is under investigation.

No conflict of interest

ORAL PRESENTATION

HEALTHCARE AND EPIDEMIOLOGY

Screening for type 2 diabetes

O-0072

An Australian type 2 diabetes risk assessment tool based on demographic, lifestyle and simple anthropometric measures

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Aims: To develop and validate a diabetes risk assessment tool for Australia based on demographic, lifestyle and simple anthropometric measures.

Methods: 6,060 participants from the Australian Diabetes, Obesity and Lifestyle study, aged over 25 years without diagnosed diabetes at baseline were followed up for 5 years. Diabetes was defined at follow-up by pharmacological treatment or diagnostic levels for diabetes of fasting and 2-hour glucose from an oral glucose tolerance test. A total of 19 variables were considered for inclusion in the risk prediction model. They were age, gender, country of birth, education, occupation, total household income, consumption of fruit or vegetables, alcohol intake, smoking, leisure-time physical activity, television viewing time, parental history of diabetes, history of high blood glucose, use of anti-hypertensive medications, lipid-lowering treatment, history of angina, heart attack or stroke, body mass index, waist and hip circumferences. The risk prediction model was developed using logistic regression and converted to a simple scoring system. The validity of the tool was evaluated in two independent Australian cohorts using areas under the receiver operating characteristic curve (AROC) and the Hosmer-Lemeshow (HL) x^2 statistic.

Results: 362 people (194 men, 168 women) developed incident diabetes over the 5-year follow-up. Age, gender, country of birth, parental history of diabetes, history of high blood glucose, use of antihypertensive medications, smoking, physical inactivity and waist circumference were included in the final risk prediction model. The AROC of the diabetes risk prediction model was 0.78 (95% CI 0.76-0.81) and HL x^2 statistic was 4.1 (P=0.85). A score of 12 or higher (maximum 35) corresponded to the point on the receiver operating characteristic curve at which sensitivity (74.0%) and specificity (68.5%) were maximised, with a positive predictive value of 12.7%. Using a score of 15 or higher, the sensitivity, specificity and positive predictive value for identifying incident diabetes were 54.3%, 83.1% and 16.9%, respectively. The AROC and HL x^2 statistic in the two independent Australian cohorts were 0.66 (95% CI 0.60-0.71) and 9.2 (P=0.32), and 0.79 (95% CI 0.72-0.86) and 29.4 (P=0.0003), respectively.

Conclusion: This tool provides a simple, noninvasive method for Australian adults for identifying those at high risk of type 2 diabetes who may benefit from interventions to prevent or delay the onset of type 2 diabetes.

No conflict of interest

O-0073

A comparison of screening strategies for impaired glucose tolerance and type 2 diabetes mellitus in a UK community setting: a cost per case analysis

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Aims: Universal screening for vascular risk is to be introduced in the UK in April 2009, for people over 40 years. As this will have a substantial impact on health care resources, it is essential to investigate different methods for pre-screening people at high risk. Currently, there is no systematic or structured screening policy for T2DM in most countries. The aim of this study was to assess effectiveness and cost efficiency of a combination of different screening methods for undiagnosed T2DM and impaired glucose regulation (IGR included IGT and/or IFG) in a multi-ethnic community setting.

Methods: A random sample of people aged 40-75 years from 24 general practices in Leicestershire were invited for a 75g OGTT. Participants provided a detailed medical history, anthropometric measurements and completed the FINDRISC questionnaire.

Clinical effectiveness was compared using sensitivity, specificity, and area under the ROC curve. We compared 17 approaches to screening involving FINDRISC and our own Leicester self-assessment (LSA) and Leicester primary-care-data (LPD) risk scores, in addition to fasting glucose and HbA1c.

The cost-effectiveness of tests was assessed by 'cost per case', i.e. the total estimated cost of screening a specified population, modeling cost components such as nursing cost rates, nursing time, administration and lab test costs. This is then divided by the number of cases identified, as estimated using test sensitivity values from the study sample data. As an improvement on previous screening cost-effectiveness models, these models were run within a Bayesian framework, using a simulation-based approach that incorporates uncertainty around both the estimated costs and sensitivity values.

Results: 6749 individuals participated: the age range was 25-75 years (SA) and 40-75 (WE); mean age was 56.1(SD 10.8), 47.7% were male and 27.5% were of south Asian ethnicity. 6372 individuals (94.4%) had all relevant data recorded and were included in analysis; of these 202 (3.2%) were diagnosed at OGTT with screen-detected T2DM, and an additional 902 (14.2%) were diagnosed with IGR.

Estimated cost implications varied substantially for the 212 screens we considered; results for three screens are shown in the Table.

Discussion/conclusion: The suggested strategies provide a number of tools for screening people for T2DM and IGR. A stepwise screening strategy using self-assessment or practice routine data to calculate a risk score, followed by a FPG or HbA1c is an efficient screening strategy for detecting T2DM and T2DM/IGR in a community setting.

Stage 1	Stage 2	Stage 3	Proportion to OGTT (%)(SE)		Est. cost per T2DM case detected (€/$)(SE)	
HbA1c =6.0	OGTT		22.3	(0.5)	1713/2306	(55/74)
LSA=14	HbA1c=5.8	OGTT	29.8	(0.6)	1245/1676	(51/69)
LPD=5.00	HbA1c=6.0	OGTT	18.8	(0.5)	931/1253	(42/57)

Table. Sample, 3 of the 212 screening methods modelled

No conflict of interest

O-0074

Diagnostic criteria for impaired glucose regulation based on an HbA1c=6.0% lacks sensitivity in White Europeans but not South Asians

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Introduction: HbA1c% may become the preferred screening modality for identifying the glucose-specific determinants of cardiovascular risk and individuals at risk of diabetes. The impact of revised diagnostic criteria using HbA1c% rather than glucose indices to define Impaired Glucose Regulation (IGR) and Type2 Diabetes (T2DM) in a multi-ethnic setting is unknown.

To report sensitivity and specificity for HbA1c% cut-offs defining IGR as =6.0% and T2DM as =6.5% within White European (WE) and South Asian (SA) UK groups.

Methods: We analysed baseline data from a prospective screening study for IGR and T2DM (ADDITION-Leicester). Leicester is a UK urban center with a significant SA Indian (40%) population. A population sample of 36,000 40-75 (WE) and 25-75 (SA) year olds were invited for an OGTT, HbA1c% and cardio-vascular risk assessment.T2DM and IGR (composite of Impaired Fasting Glycaemia (IFG), Impaired Glucose Tolerance (IGT) and T2DM) were defined using standard WHO criteria from OGTT results.

Results: 6,749 (48%Male 25%SA) subjects responded (22% response rate) with age unadjusted prevalences of IGR 19% (WE:16% SA:20%) IFG 5% (WE:4% SA:5%) IGT 13% (WE:11% SA:13%) and T2DM 3% (WE:3% SA:5%).

see table 1

Conlusion: Defining IGR by an HbA1c=6.0% or fasting glucose of =6.0mmol/l lacks sensitivity in WE 40-75 year olds. The higher prevalence of IGT in SAs limits the usefulness of fasting glucose but may enhance the sensitivity of an HbA1c% IGR cut-off of =6.0 in this group. Defining T2DM by an HbA1c=6.5 will result in approximately 30% of those currently diagnosed using an OGTT via WHO not meeting revised T2DM criteria. This may have important implications for micro- and macro-vascular surveillance.

No conflict of interest

O-0075

HbA1c and prediction of diabetes: Inter99, AusDiab and D.E.S.I.R.

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Background: In the past HbA1c had not been validated as a diagnostic tool for diabetes, mainly because the assay was not standardized. HbA1c use for diabetes diagnosis is now again proposed as there is a new reference assay. We compare the performances of HbA1c and fasting plasma glucose (FPG) for predicting incident diabetes in three cohort studies.
Methods: Data are from three cohorts: Danish (Inter99, baseline 2000), Australian (AusDiab, 2000) and French (D.E.S.I.R., 1994) with respectively 4630, 5770 and 3858 men and women, aged 30-60 (mean 46 years), 25-88 (51 years), 30-65 (47 years). Diabetes incidences were estimated at five years for Inter99 and AusDiab, and at six years for D.E.S.I.R. Diabetes was defined by diabetes treatment or FPG≥7.0 mmol/l or 2-h plasma glucose (2-hPG)≥11.1 mmol/l excepting for D.E.S.I.R where 2-h PG was not available. In each of the three cohorts, we evaluated the incidence and show smoothed incidence curves, and the positive predictive values for diabetes, of HbA1c, and FPG.
Results: The cohorts were analysed separately. The HbA1c distributions differed: Inter99 (mean±SD, 5.9±0.4%), AusDiab (5.5±0.3%), D.E.S.I.R (5.4±0.4%) in contrast to similar FPG, respectively 5.4±0.5 mmol/l, 5.5±0.5 mmol/l, 5.3±0.5 mmol/l. The incidence of diabetes was 3.0% in D.E.S.I.R, 3.4% in AusDiab, higher in Inter99: 4.5%. For HbA1c, the incidences and the positive predictive values for diabetes differ from one study to another; in contrast, for FPG, the cohorts show similar characteristics. Incidence and positive predictive value increased with increasing HbA1c and FPG.
Conclusion: In each cohort, incident diabetes is associated with HbA1c and FPG at baseline. The distributions of these two glycemic parameters differ between cohorts, more so for HbA1c.

No conflict of interest

O-0076

Leicestershire self assessment score for impaired glucose regulation for use in a multi ethnic setting

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Introduction: One in five of those screened in the ADDITION-Leicester population based screening study had some form of Impaired Glucose Regulation (T2DM or impaired fasting glucose (IFG) or impaired glucose tolerance (IGT)) (IGR). Modelling studies have shown that early detection of IGR and appropriate intervention can decrease morbidity and early mortality from cardiovascular disease. Self assessment scores identify those at high risk and are particularly useful in populations where response rates to screening programmes are low. To date no self assessment scores have been developed and validated for multi ethnic populations.
Methods: We used data on 6,390 subjects aged 40-75 from the ADDITION-Leicester screening study from a multi ethnic UK setting (76% White European, 22% South Asian, 3% other). All participants were given a 75g Oral Glucose Tolerance Test. We developed logistic regression models for predicting IGR (IFG/IGT/T2DM) using data from self reported questionnaires. Using the best fitting model we developed the Leicester Self Assessment Score. Initial analysis was carried out using complete cases only, then missing data indicators were used as a check for robustness of the modelling. We externally validated the tool using data from 3,298 subjects aged 40-75 screened as part of a second screening study.
Results: The final model includes age, ethnicity (White European versus other – predominantly South Asian), sex, 1st degree family history, antihypertensive therapy or history of hypertension, waist circumference and body mass index. The score ranges from 0 to 47. Validating this model using the STAR data gives an area under the ROC curve of 71% (95% CI 68% to 74%). Using a cut point of 16 to predict those at high risk of IGR had a sensitivity of 82%, specificity of 47% and correctly classified 53% of cases.
Conclusions: The Leicester Self Assessment Score can be used to reliably identify those at high risk of IGR in multi ethnic populations. The score is simple (7 questions) and non invasive.

No conflict of interest

O-0077

Prevalence of impaired fasting glucose, type 1 and 2 diabetes in a Spanish working population stratified by occupational categories. ICARIA-DM study

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Background and aims: An inverse relationship exists between social position and incidence of diabetes. Yet little is known about the relationship of occupational categories and the prevalence of impaired fasting glucose. One aim of the study was to know the prevalence of impaired fasting glucose (IFG), type 1 (T1DM) and type 2 (T2DM) diabetes, by occupational categories, within a nationwide working population.
Material and methods: This was a cross-sectional study of 375,607 workers, 72.3% male (M), mean age (SEM) of 36.87 (0.02) yr. All subjects underwent a routine medical check up from January 2007 to December 2007 at Ibermutuamur. A structured questionnaire, physical examination and standard serum biochemical analysis were performed. Workers were classified into nine major categories according to the 1994 Spanish national Classification of Occupations: Workers in the first four categories were grouped as non-manual (white collar) and workers in the last five categories as manual (blue collar). IFG was defined as a fasting glucose level between 100-125 mg/dl (without T1DM or T2DM diagnosis); T1DM (previous diagnosis of T1DM); T2DM (previous T2DM diagnosis or treatment or fasting glucose level ≥ 126 mg/dl.).
Results: 84.1% Males (M) and 94.3% females (F) showed a normal glycemic

table 1

		Sensitivity (95% CI)			Specificity (95% CI)		
		Total	**WE**	**SA**	**Total**	**WE**	**SA**
Fasting Glucose (mmol/l)	=6.0 (IGR)	43.2 (40-46)	44.7 (41-48)	44.3 (39-50)	98.7 (98-99)	98.6 (98-99)	99.0 (98-99)
	=6.5 (IGR)	21.0 (19-23)	20.9 (18-24)	26.2 (21-32)	99.9 (99-100)	99.9 (99-100)	99.9 (99-100)
	=7.0 (T2DM)	66.0 (59-73)	65.6 (57-74)	66.5 (54-77)	99.6 (99-100)	99.7 (99-100)	99.7 (99-100)
HbA1c%	=6.0 (IGR)	51.7 (49-55))	45.2 (42-49)	70.5 (65-76)	84.0 (83-85)	86.9 (86-88)	74.43 (72-77)
	=6.5 (T2DM)	70.4 (64-77)	64.8 (56-73)	79.4 (68-88)	96.9 (96-97)	98.1 (98-99)	93.7 (91-95)

profile. IFG, T2DM and T1DM prevalences (%) among M/F were as follows 12.6/4.7; 3.0/0.7 and 0.4/0.2, respectively.
Table 1 shows the prevalence of IFG/T2DM/T1D in the studied population stratified by occupational categories. Percentage (95% CI)

	IFG	T2DM	T1DM
White Collar	**7.3 (7.2-7.5) n=9710**	**1.5 (1.5-1.6) n=2070**	**0.3 (0.2-0.3) n=363**
General managers and government administrators	12.3 (11,5-13.0)	3.7 (3.3-4.2)	0.2 (0.1-0.3)
Scientific professionals, technicians, intellectuals	7.4 (7.1-7.6)	1.6 (1.3-1.6)	0.3 (0.2-0.3)
Support technicians and professionals	7.2 (7.0-7.4)	1.6 (1.5-1.7)	0.3 (0.2-0.3)
Clerks and related jobs	5.8 (5.5-6.1)	1.0 (0.9-1.1)	0.3 (0.2-0.3)
Blue Collar	**12.0 (11.9-12.2) n=29297**	**2.8 (2.8-2.9) n=6908**	**0.3 (0.3-0.3) n=775**
Catering and hospitality, personal and security service workers, and salesmen/women and shop assistants	8.7 (8.3-9.0)	1.8 (1.6-1.9)	0.3 (0.2-0.3)
Skilled workers in agricultural and fishing industries	13.6 (12.2-15.0)	3.9 (3.1-4.7)	0.6 (0.3-0.9)
Craftsmen/women and skilled workers in manufacturing, construction and mining	12.9 (12.7-13.1)	3.1 (2.9-3.2)	0.3 (0.3-0.4)
Machine installers, operators, and assemblers	13.0 (12.7-13.2)	3.4 (3.2-3.5)	0.3 (0.3-0.4)
Unskilled workers	11.7 (11.4-11.9)	2.5 (2.4-2.7)	0.3 (0.3-0.4)
Total	**10.4 (10.3-10.5)**	**2.4 (2.3-2.4)**	**0.3 (0.3-0.3)**

Conclusion: In a nationwide Spanish working population, glycemic profile alterations are common. As in T2DM, the prevalence of IFG is high among workers with low occupational position (blue collar), but general managers, among white collar workers, have similar prevalence to manual workers. This is not true for T1DM. These data could serve as a basis for preventive programs.

No conflict of interest

O-0078

The distribution of glycated hemoglobin (A1c) levels among U.S. adolescents during 1999-2006

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Aim: To describe the distribution of A1c among adolescents without diagnosed diabetes in the U.S.
Methods: We used data from the National Health and Nutrition Examination Survey (NHANES) for the years 1999 through 2006. Our sample included 8214 non-pregnant youth 12 to 19 years of age without diagnosed diabetes, 3629 of whom completed a fasting glucose test. We defined impaired fasting glucose (IFG) as a fasting glucose level of 100 to 125 mg/dL. We defined overweight as having body mass index (BMI) greater than or equal to the 95th age-sex-specific percentile, and at risk for overweight as having BMI between the 85th and 95th percentiles. We estimated the mean and selected percentiles of A1c overall and by sex, age, race or ethnicity, weight status, and fasting glucose status.
Results: Among non-pregnant U.S. youth without diagnosed diabetes, mean and median A1c were 5.14%, and 5.11% respectively (see table). A1c levels were higher at all percentiles among males than females, among youth aged 12-15 y than those 16-19 y, and among non-Hispanic black youth than among Mexican American and non-Hispanic White youth. The highest levels of A1c were present among those with IFG (mean 5.27%), non-Hispanic blacks (5.25%) and overweight youth (5.22%). However, among the 8214 adolescents in our sample, only 35 (estimated 0.3% of the population) had an A1c level of 6% or greater. Only 6 of 415 participants (estimated 1.2% of the population) with IFG had A1c greater than or equal to 6%.

Table 2: Means and percentiles of A1c among U.S adolescents without diagnosed diabetes, 1999-2006.

Conclusions: The distribution of A1c varies in US adolescents. Small but significant differences between groups are present at all percentiles of the distribution. Very few adolescents have A1c values above 6%. More research is required to determine the health consequences of A1c level in youth without diabetes.

No conflict of interest

O-0079

Type 2 diabetes diagnosed by the oral glucose tolerance test - evidence for a heterogeneous presentation of the disease

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Aims: early recognition of high-risk subjects for type 2 diabetes, which is occurring in epidemic proportions worldwide, is a public health goal. Despite attempts to lower FPG cut-off values to diagnose diabetes without resorting to the OGTT, the latter is more sensitive than FPG alone in detecting diabetes or prediabetes. Our goal was to explore the ability of OGTT in detecting sub-groups of diabetics with different clinical-laboratory features.
Methods: we executed OGTT in 1277 non diabetic subjects (583 men and 694 women), who presented risk factors like obesity, hypertension, diabetes, family history of metabolic abnormalities and dyslipidemia. By ADA criteria, 103 subjects (8.1%), 52 men and 51 women, were found to be affected by type 2 diabetes. On the basis of the accepted glycemic cut-off values for diagnosing type 2 diabetes (FPG > 125 and/or 2h plasma glucose, 2hPG, = 200 mg/dl), the 103 newly recognized diabetic subjects were divided in 3 sub-groups. Group A: FPG > 125 and 2hPG <200 mg/dl (n = 22, 7 women); group B: FPG = 125 and 2hPG = 200 (n = 55, 30 women); group C: FPG >125 and 2hPG = 200 mg/dl (n = 26, 14 women). In all these new diabetic subjects we considered age, BMI, waist circumference (WC), diabetes inheritability and calculated the estimated insulin sensitivity (EISI) and the first phase of insulin secretion (1fsPH) by OGTT data combined to associated plasma insulin measurements (FPI and 2hPI).
Results: Age, BMI, WC, diabetes inheritability and sex distribution were not different among the three sub-groups. EISI was significantly lower in group B than group A, 2hPI and 1fsPH significantly higher than that calculated in group C. In group A, 1fsPH was significantly higher than in group C.
Discussion: A diabetic subject with isolated high 2hPG has impaired insulin sensitivity as compared to a diabetic subject with isolated high FPG. When both these glycemic values are high, a crucial worsening of insulin secretion is evident. These data are consistent with a heterogeneous presentation of type 2

table 2

			Percentile				
	Mean	95% CI	10th	25th	50th	75th	90th
All Youth	5.14%	5.13% to 5.16%	4.79%	4.96%	5.11%	5.28%	5.43%
Male	5.16%	5.15% to 5.18%	4.81%	4.97%	5.13%	5.30%	5.50%
Female	5.12%	5.10% to 5.13%	4.77%	4.94%	5.08%	5.25%	5.40%
12-15 y	5.17%	5.15% to 5.18%	4.83%	4.97%	5.14%	5.30%	5.49%
16-19 y	5.12%	5.10% to 5.13%	4.77%	4.94%	5.08%	5.25%	5.40%
Mexican American	5.16%	5.14% to 5.18%	4.85%	4.97%	5.12%	5.29%	5.40%
Non-Hispanic white	5.10%	5.08% to 5.12%	4.78%	4.94%	5.08%	5.22%	5.38%
Non-Hispanic black	5.25%	5.23% to 5.27%	4.79%	5.04%	5.25%	5.41%	5.60%
Normal weight	5.12%	5.11% to 5.14%	4.78%	4.95%	5.09%	5.26%	5.40%
At risk for overweight	5.14%	5.12% to 5.16%	4.80%	4.96%	5.11%	5.27%	5.41%
Overweight	5.22%	5.20% to 5.24%	4.86%	4.99%	5.17%	5.34%	5.54%
Normal fasting glucose	5.13%	5.11% to 5.15%	4.79%	4.96%	5.10%	5.26%	5.40%
IFG	5.27%	5.24% to 5.30%	4.91%	5.07%	5.25%	5.40%	5.59%

diabetes, which is detectable by a simple method like OGTT, thus allowing the possibility of specific treatments. Finally, it is noteworthy that OGTT permitted the diagnosis of a greater proportion of newly recognized type 2 diabetics (55/103, 53.4%) who would have been considered non-diabetic had FPG alone been used. These patients would not have been treated for diabetes. Based on FPG alone, only 26 patients would have been correctly detected without OGTT, whereas 22 had a 2hPG <200 mg/dl, thus requiring a different therapeutic management than true diabetics.

No conflict of interest

ORAL PRESENTATION

EDUCATION

Effective education: process and outcome

O-0080

Best and promising practices in diabetes education

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Background: The Canadian Diabetes Association developed an evidence-based project to identify 'best' and 'promising' practices in diabetes education. An assessment tool identified these practices, and findings were disseminated to diabetes educators, health professionals, government and key decision makers of diabetes education programs.
Aims: The Association's goal is to increase the capacity for the creation of integrated, evidence-based, responsive diabetes education programs and services across Canada by improving awareness and knowledge of best and promising practices in diabetes education.
Method: The first phase of the project focused on selecting an assessment tool to review and identify practices as 'best' or 'promising'. The assessment tool consists of two sets of criteria: effectiveness and plausibility.
During the **second phase** of the project, an extensive search of published literature was undertaken, which provided a snapshot of existing Canadian and international diabetes education practices during a 10-year period (1997-2007).
Nominations were also solicited from all Canadian Diabetes Educator Sections to help identify practices that may not have been identified through the published literature.
In the **third phase** of the project, inclusion/exclusion criteria were applied to the results from the literature search in order to identify practices directly relevant to the search questions.
From the published literature, 258 articles were identified. Based on the inclusion/ exclusion criteria, 143 English- and 28 French-language articles (representing 137 different practices) were considered for assessment.
From the nomination process, 16 English- and 7 French-language nominations were considered for assessment.
Results: Of the 137 practices identified through the published literature and evaluated using the assessment tool, 18 were ranked as 'best,' 27 were ranked as 'promising,' 72 were ranked as 'to be watched' and 20 were ranked as 'do not include.' Of the 23 nominated practices, one was ranked as 'promising.'
Conclusion: Of the 45 best and promising practices contained within the catalogue, only two are from Canada and only one resulted from the nomination process. These results emphasize the need to evaluate diabetes education programs in Canada. The project has successfully contributed to the field of diabetes education by creating an accessible catalogue of best and promising practices that are evaluated and show positive health outcomes.

No conflict of interest

O-0081

ROMEO (Rethink Organization to Improve Education and Outcomes): A 4-year multicentre randomised controlled trial of Group Care for the management of type 2 diabetes.

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Background and aims: We showed previously (Diabetes Care 27;670:2004) that type 2 diabetes (T2DM) is managed effectively by continuous systematic group education (Group Care), which substitutes traditional one-to-one visits with sessions centred on hands-on and problem-solving activities, role playing and discussions on motivation, diabetes acceptance, psychosocial and coping strategies. Sessions last 40-50 minutes, are held every 3-4 months and are followed by brief individual consultations with a physician. A multicentre clinical trial was organised to ascertain if Group Care would perform as well in diabetes clinics throughout Italy.
Patients and methods: 815 patients with non insulin-treated T2DM from 13 Italian clinics were centrally randomised to either Group or one-to-one Care. Operators were specifically trained and provided with a detailed operating manual and educational materials. At baseline, the 2 treatment groups were similar by age, gender, known duration of diabetes, BMI, HbA1c, lipids, quality of life, knowledge of diabetes and health behaviours, as assessed by questionnaires. Analysis was by intention-to-treat. 592 patients from 11 clinics completed the 4-year follow-up. Results are adjusted for participating centre, gender, family history for diabetes, schooling, occupation, years of attendance in clinic and baseline values of the relevant variables.
Results: After 4 years, the patients followed by Group Care had lower HbA1c [-1.49% (-1.63/-1.34)], fasting blood glucose [-19.1 mg/dl (-27.1/-11.1)], weight [-3.15 Kg (-4.21/-2.08)], BMI [-1.09 (-1.56/-0.62)], systolic [-4.4 mmHg (-7.3/-1.5)] and diastolic [-3.3 mmHg (-5.2/-1.3)] blood pressure, triglyceride [-44.8 mg/dl (-56.0/-33.5)] and total cholesterol [-25.7 mg/dl (-31.8/-19.5), and higher HDL cholesterol [+5.2 mg/dl (+3.5/+7.0)] than those followed by traditional care. They also had better quality of life [-16.8 (-18.3/-15.2)], knowledge [+10.6 (+8.9/+12.3)] and health behaviours [+4.2 (+3.8/+4.5)]. All differences were significant at $p<0.001$.
Conclusions: Group Care produces better clinical, cognitive and psychological outcomes than traditional one-to-one care when applied within a structured systematic programme. However, it requires re-organization of working practices, which may account for failure of two participating clinics in implementing it. (ROMEO was supported by an EFSD-Novo Nordisk grant for T2DM research in Europe)

No conflict of interest

O-0082

A culturally appropriate diabetes self-management education network in community--evaluation of JSIDEM study (a multicenter,randomized and controlled pilot study)

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Aims: To establish a culturally appropriate diabetes self-management education network in Jiangsu province of China (Jiangsu intensive diabetes education and management study, JSIDEM study) and to evaluate the outcomes such as the levels of diabetes knowledge, metabolic control and self-management skills.
Methods: A total of 664 patients with type 2 diabetes mellitus were recruited from seven hospitals in Jiangsu province of China and were assigned to intensive diabetes health education program (intensive group, n=376) or conventional education program (control group, n=288). The intensive group received diabetes self-management education for 5 sequential days followed by subsequent regular advice based on educational focus (information, lifestyle behaviors, glucose monitoring and self-management skills) by telephone, short messages or internet. In the control group, subjects received education once a week for up to five weeks (whole day each time) followed by regular

advice, and outcomes were classified as knowledge, glycemic control and self-management skills at baseline, 3 months, 6 months, and 12 months, using questionnaires and laboratory data.

Results: There were no significant difference between two groups in age, gender, diabetes duration, education level, work status, type of insurance, HbA1c, blood pressure, BMI and lipid profile at baseline. Over the 12 months of the study, intensive group showed an increase in knowledge scores, improvement in self-management skills, and reduction in HbA1c, BMI, blood pressure and lipid profile. HbA1c level in intensive group was reduced by 2.3% on average. The percentage of patients with HbA1c<6.5% was increased from 15.63% to 58.82% (3 months), 47.45%(6 months) and 40% (12 months) respectively(P<0.05). On the other hand, HbA1c level in control group was reduced by 1.63% on average. The percentage of patients with HbA1c<6.5% was increased from 7.69% to 25%(3 months), 10.34%(6 months) and 10.53%(12 months) respectively(P>0.05). The rate of patients' BMI meeting 25kg/m^2 criteria was elevated from 54.52% to 61.17% (3 months), 60.37%(6 months), 60.9%(12 months) respectively in intensive group(P<0.05). However, there was no significant difference in control group. Comparing blood pressure and lipid profile of the two groups after 3, 6 and 12 months intervention, there were no significant differences.

Conclusions: Evidence supports the positive effectiveness of DSME-net on knowledge, frequency and accuracy of self monitoring of blood glucose, self-reported dietary habits, and better glycemic control was demonstrated in the study with short follow-up (12 months).

No conflict of interest

O-0083

A specific educational approach aimed at improving lifestyle behaviour and reducing risk factors for 3,000 persons with diabetes in Burundi

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Aims: APSA is implementing an educational program in Burundi for people with diabetes, or at risk of developing cardiovascular diseases. Over a period of 3 years (2007-2010), 3000 people will be monitored in a project financed by the World Diabetes Foundation. An intermediate evaluation of a group of 292 individuals, who attended at least 2 educational sessions, has shown encouraging results.

Method: This approach to educating patients with diabetes is based around a minimum of 3 sessions (The learning nest). Subjects covered include: cardiovascular risks, fat intake in the diet and managing physical activity. With the help of a specially developed manual, patients work in groups of 8 to 10, to acquire the necessary medical knowledge in an effective way, while taking into account individual, social, and cultural environments. Between 2007 and 2008, APSA, in collaboration with its training consultants, trained 27 doctors, 43 nurses and 23 educators from twelve public and private health structures in Bujumbura. Health care professionals work together to provide early detection of diabetes and the metabolic syndrome through targeted screening of risk factors. By March 2009, 1600 individuals had joined the educational network, attending sessions given by trained nurses and educators. During the first educational session, participants' modifiable risk factors were noted in their manuals. Proper monitoring and follow up of eating habits and lifestyle behaviour is possible over a period of 5 years.

Results: Of the 292 individuals who took part in a second educational session on 'how to reduce cardiovascular risks', in the first year, 38% improved their health status, 33% their blood sugar level, 28% their blood pressure, 24% reduced their waist circumference, and 36% stopped smoking. The most popular of the 10 choices of actions to be taken during the first educational session, was reducing fat intake in the diet, the second walking 30mins daily and the third reducing salt intake. During the second educational session participants could alter their choice to suit their daily lifestyle better, and 'reduction of refined sugar' became the 3rd most popular.

Discussion: The results bring a discussion on implementing a therapeutic educational approach that will generate long term compliance towards adopting healthy lifestyle behaviour in participants. This will reduce their modifiable risk factors, and help them avoid diabetes complications, in a country, impoverished by 12 years of war, where medical care and medication are not accessible to the vast majority.

No conflict of interest

O-0084

The implementation of staged diabetes management in public and private diabetes centers in Brazil

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Aim: This study assesses the implementation of a systematic approach to comprehensive management of diabetes and its complications. Staged Diabetes Management (SDM) was employed to train health professionals and implement new diabetes management procedures in public and private health care systems. The overall aim was to determine how effective SDM was in improving management of complications associated with diabetes.

Methods: This prospective study was done with the SDM program to assess the impact on standard diabetes care in Brazilian primary care clinics and private health systems. SDM clinical pathways (DecisionPaths) were customized by local experts to account for the unique health care systems in three geographically dissimilar states in Brazil. SDM was customized for family health programs in Bahia state (12 primary care units) and in Ceara state (4 primary care units). Additionally, it was customized for five private diabetes multidisciplinary centers (physicians, nurses, dietitians and psychologists) in five cities in southern Brazil. Baseline and end of study (6 months) data were collected using the PACES audit form (a multi-national standard chart audit that consists of 40 sentinel events (e.g. amputations) that measure both diabetes care processes and outcomes.

Results: Six months after SDM implementation in public health care settings, lower-extremity amputations due to diabetes were reduced by 45% (p<0.001) and hospitalization for hyperglycemia treatment decreased by 63% (p<0.01). Additionally, the SDM program was initiated in five private health clinics using a multi-disciplinary health team model. Changes in quality of care were documented in these health systems with higher numbers of foot examination, screening of chronic complications with microalbuminuria and retinal evaluation. Health professionals in private health systems increased the treatment of dyslipidemia from 40% of patients at baseline to 60% after SDM training (p<0.001). Within private clinics, prior to the SDM program 15% of patients had individual or group education compared to 40% after 6 months (p<0.001), in spite of out-of-pocket expenses.

Conclusions: Diabetes morbidity and mortality depend on quality of care. We concluded that SDM implementation improved quality of diabetes care in both public and private medical centers in three geographically dissimilar states in Brazil.

No conflict of interest

O-0085

Erratic versus structured self measurement of blood glucose in type 2 diabetes – impact on cost and benefit for the German health care system

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Background/aims: Diabetes mellitus is now a widespread disease in Germany. Actually, over 7 million people are diagnosed with the condition. Considering the worldwide rising prevalence, the challenges for the German health care system will be considerable, also in economic terms.

The discussion about the value of SMBG in the management of non insulin dependent Type 2 diabetes is still ongoing. In assessing the benefit, it is often ignored that SMBG is only a diagnostic test and can not have – contrary to pharmaceuticals – an intrinsic effect. Application of appraisal methods used for the evaluation of pharmaceuticals can provide misleading results.

Methods: We conducted a cost-effectiveness and budget impact analysis of SMBG using a validated Markov state model to assess the clinical impact and related cost when SMBG is performed by non-insulin requiring patients with type 2 diabetes in a structured manner (e.g. seven-point profile during 3 days monthly). The assumptions of additional clinical effects on blood pressure or lipid levels are based on preliminary data from two ongoing RCTs analyzing the effect of structured versus erratic SMBG. Accordingly, we assumed an improved glycemic control (HbA1c reduction 0.4 %) and an additional improvement of blood pressure and lipid levels by 5% (scenario 2), 10% (scenario 3) and 15%

(scenario 4) of the baseline values. The simulation time was set to 10 years or death of the cohort member. Costs were calculated with a German cost data reflecting a third-party-payer perspective. The impact of different discount rates on costs and life expectancy was investigated in sensitivity analysis (range of 0 and 5 %).

Results:

Scenario	1	2	3	4
Cumulated cost over 10 years (EUR, undiscounted)	22,082	21,169	20,287	19,433
Incremental cost (EUR, undiscounted)	-	- 913	- 1,795	- 2,649
Life expectancy (in years, undiscounted)	8.495	8.585	8.673	8.760
Incremental life expectancy (in years, undiscounted)	-	0.09	0.178	0.265
Cost per life year gained (EUR/ LYG, undiscounted)	-	- 10,144	- 10,084	- 9,996

Budget impact analysis (based on scenario 2, an actual SMBG use by 37 % of non-insulin treated T2 patients and a yearly switching rate of 0.087) yields cost savings of 83.3 Mio EUR within 5 years.

Conclusion: Self measurement of blood glucose (SMBG) can represent a valuable and cost effective element in the therapeutic approach of non-insulin treated diabetes, if some prerequisites are fulfilled.

An adequate use of SMBG by the patients and an assessment of the benefits with appropriate health economic methods will yield potential cost savings for the statutory health insurance.

No conflict of interest

O-0086

How to identify and to choose appropriate footwear in orthopedic high risk diabetic patients ?

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Aims: Presentation and evaluation of a preventive educational program for foot complications designed for orthopedic high risk Diabetes Mellitus patients.

Methods: This program of Education and Evaluation is built around an educational tool called "Identifying and Choosing a Good Pair of Shoes" devised by the health care team. The playbox (footbox) contains cards describing footwear (the heel, the outer sole, the insole, shape and quality of a shoe) and invites the patient to compare his own shoes with the information given on the cards and thereby to deduce the qualities and imperfections of his current footwear. Vidéo CD Rom on computer insist on diabetic orthopedic high risk: the what, the why, the whom and the prevention.

92 diabetics all neuropathic with or without arteriopathy follow the program.

The first visit (V1), destined to promote patient awareness, consists of personal risk assessment by foot examination. The footbox is used for baseline assessment of footwear. The second visit at 3 months (V2) consists in group education session about preventing major foot ulcers (self examination, foot care, choosing a shoe) and a second evaluation of current footwear via the "footbox". The third visit at 6 months (V3) consists of a video CD Rom reminder of the main guidelines discussed at V1 and V2 and a third evaluation via the "footbox". The fourth visit at 12 months (V4) consists of an evaluation by foot examination and by footwear.

Results: Study patients attitudes from V0 to V4 showed better adapted footwear: 32 to 58 %, less callus: 49 to 39%, less fungal infection: 24 to 13%, less wound: 29 to 10%.

Discussion/conclusion: This tool helps mainly:

- to quantify changes in habits in the short term
- to measure in the long term its impact in preventing foot injury
- to highlight the impact of education in preventing secondary complications.

These encouraging results incite us to pursue education with this program in all diabetic patients at high risk of foot injury.

No conflict of interest

ORAL PRESENTATION

LIVING WITH DIABETES

Programmes for secondary prevention of complications

O-0087

A model for diabetes care at schools by Finnish Diabetes Association

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There is a legislative gap in Finland: no one has the responsibility to carry out the measures of diabetes care in school environment. Therefore children have mutually an inequal status totally depending on the school they attend. Part of the children have right to a professional and safe diabetes care during their school day whereas some depend on their parents coming to school to give insulin and count carbohydrates. As a result of the influence of Finnish Diabetes Association, authorities have now 1) launched a national recommendation and a model of diabetes care during school day and 2) started developing new legislation. Finnish Diabetes Association managed in this by producing factual information, contacting key-decision makers, educating and by raising public awareness. Finnish Diabetes Association ran a study in 2006 in order to get a full picture of the problems nation-wide. With the results as evidence, Finnish Diabetes association contacted the Ministry of Education and Ministry of Social Affairs and Health who, based on this, set up a work group. To safeguard the interest of the children with diabetes Finnish Diabetes Association published its own form to serve as an agreement tool for parents and schools while the official form was to be waited. The publishing date was UN World Diabetes Day 2007 and presentation was done both in the main TV news and newspapers. Publicity increased the demand for education, and Finnish Diabetes Association continued consulting both school staff and paediatrics serving as a channel in between the ministry level work group and school world. Parents taking contact straight to the ministries and parliament added very strong impact on ministry level working group. The ministry level recommendation includes general guidelines on who is responsible for each part of a child's diabetes care at school and instructions how to educate a person to be able to perform the task. The form serves as an individual tool for each child with diabetes. The tone of the recommendation is very positive. The purpose is to make the day at school safe and simple not only to the child with diabetes but as well empower the named staff at school the same way. Finnish Diabetes Association has consulted among others the Swedish Diabetes Association with creating a model. The Finnish national ministry level recommendation and model form will be available to public at World Diabetes Congress in Montreal.

No conflict of interest

O-0088

Better diabetes care with peer support

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Improvement in quality of diabetes care is essential for reducing diabetes complications. Simultaneous involvement of primary care physicians, patients, their families and other health care providers is of utmost importance in achieving diabetes management goals.

Aim: To assess the impact of diabetes education to both primary care physicians and patients along with peer support groups on importance of laboratory tests and treatment compliance, and to assess the effect of this intervention in improving metabolic control as measured by HbA1c levels.

Design and methodology: In a two pronged educational programme, a team of diabetologists, dieticians and diabetes educators interacted with primary care physicians and peer supporters. The study was conducted over 2 years and included 650 diabetes patients, 15 primary care physicians and 35 peer supporters.

In a two day workshop lasting 3 hours a day, sensitization about the basics of diabetes, its complications, smoking and alcohol cessation and therapeutic options was done.

Selection of Peer Supporters:

1. To be selected by the primary care physician of that locality, having type 2 DM for > 5 years with adequate understanding of the disease.
2. These role models were trained and organized group meeting with diabetes patients and discussed any treatment issues and encouraged smoking/alcohol cessation.

Results: Out of 650 patients, 50 left before completion of study. The proportion of diabetics getting HbA1c testing at least annually rose from 15% to 38%. Patients undergoing ophthalmology visit increased from 120 to 228. Microalbuminuria testing went up from 33 to 180 and lipid testing went up from 11% to 33%.

Discussion: Peer support plays a crucial role in managed diabetes care. Patients with good understanding of diabetes can be "Role models" for others in promoting awareness and encouraging adoption of a healthy life style. The study proves that diabetes education improves treatment outcomes.

No conflict of interest

O-0089

Social relationships and school outcomes among young adults in the Diabetes Attitudes, Wishes and Needs youth study

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Aims: This study assessed the association of social relationships in school with impact on school attendance, performance, and activity participation among young adults with diabetes.

Methods: Data are from a cross-sectional internet survey of independent national samples of patients with diabetes aged 18-25 (N = 1905) from the Diabetes Attitudes, Wishes and Needs (DAWN) Youth Study. Respondents from Brazil, Japan, the US and 5 European countries provided self-report data for all measures. The sample for this analysis consisted of 400 respondents who were still attending school. Social relationships at school included whether teachers and students treated the respondent better or worse than others because of having diabetes, and whether the respondent could get help managing diabetes, if needed, from teachers, students, school nurses, or nobody. Hierarchical multiple regression assessed the significant ($p<.05$) independent associations of school attendance, performance, and activity participation with social relationships at school, controlling for country of residence and respondent demographic and disease characteristics.

Results: School relationships accounted for 16% of the variance in school attendance, 14% of the variance in performance impact, 24% of the variance in activity participation. Teachers treating respondent worse was associated with lower attendance, more impact on performance and less activity participation. Students treating respondent worse was associated with less activity participation, and students treating respondent better was associated with lower attendance. Diabetes assistance available from school nurses was associated with higher attendance and activity participation. Diabetes assistance available from students was associated with higher activity participation. Lack of available diabetes assistance was associated with more impact on school performance.

Discussion/conclusion: Social relationships play an important role in school outcomes among young adults with diabetes. Teacher discrimination against students with diabetes had the strongest and most consistent (negative) impact. Relationships with other students had both positive and negative consequences, depending on whether differential treatment was positive or negative. Potential support for diabetes needs from students and nurses was associated with better outcomes. These findings suggest the need for teacher training programs and student education regarding diabetes, and an increased nursing presence for youth with diabetes in schools.

Conflict of interest:
Paid lecturing: Mark Peyrot, Novo Nordisk
Advisory board: Mark Peyrot, Novo Nordisk
Commercially-sponsored research: Mark Peyrot, Novo Nordisk

O-0090

Measuring diabetes health: a capability approach in the Swedish National Diabetes Registry

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Aim: To present a method for measuring diabetes related health taking a capability approach (CA). In a health related CA the focus is on an individual's health functionings, such as being in good health, having health knowledge, or ability to overcome health problems. The CA approach in this study is limited to diabetes related functionings.

Method: Using a recently developed diabetes questionnaire (NDR), 4743 Swedish diabetes patients, at 23 diabetes care centres, reported their perceived functioning for: (1) health knowledge (7 questions about self care management of diabetes and quality in the communication with health care personnel), (2) social life and working conditions (5 questions about the individual's ability to overcome diabetes related problems in daily life activities), (3) confidence (5 questions about anxiety for complications and access to diabetes health care services), and (4) self-respect (3 questions about having self-respect in the relationship with health care personnel). All questions were measured on a 5 point Likert scale. These ordinal data have to be transformed into a scalar, or cardinal, measure. We use Item Response Theory (IRT) for the estimation of cardinal scales to each of the 4 functioning variables. IRT allows us to estimate scores for each individual and each functioning. These scores, will then be linked to individual observation in NDR on medical conditions such as HbA1c, cholesterol, blood pressure, BMI, type of diabetes, current treatment etc.

Results: The results show variation among diabetes patients in all of the 4 functionings. On average the results show more problems in overcoming problems in social life and at work and in anxiety among type I diabetes than in type II. For type II patients the results indicate increased problems in social life and working conditions, and more anxiety for patients on insulin treatment then for patients on diet or oral treatment. The result shows variations in patient health knowledge between health care centers. Patients with HbA1c >7.5% show lower (worse) scores in all the 4 health related functionings.

Discussion: To our knowledge this is the first study on diabetes health taking a capability approach. We think that a CA will prove very useful since it takes into account not only medical data on health but also information on individual functioning and ability to overcome diabetes related problems on an individual base. Such will improve the quality in the daily medical decision making. From a health policy perspective, the CA would generally imply that the government should support activities that brings each individual's health functioning as high as possible, given his or her own features. This questionnaire is planned to be used as a part of the online registration in The Swedish National Diabets Registry

No conflict of interest

O-0091

The eleven-year results (1997-2008) of the Israeli-Georgian program "diabetes in pregnancy"

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The purpose of the present work was to evaluate the eleven-year results (1997-2008) of the program Diabetes in Pregnancy, aimed at approximating pregnancy outcomes in diabetic women to that of the non-diabetic ones.

Methods: In total, 184 women with Pre-GDM (T1DM) (mean age 24$\pm$ 6 yrs, diabetes duration 11.2$\pm$ 6.4 yrs) and 59 women with GDM were enrolled in the study. The patients were divided into 4 groups (Gr.): Gr.1 - 78 patients who received specialized pre-conception care; Gr.2 - 62 patients enrolled in the program at < 10 weeks of gestation (5.6$\pm$2.1 weeks); Gr.3 - 44 patients enrolled in the program at > 10 weeks of gestation (19.5$\pm$6.1 weeks); Gr.4 - 59 women, all with GDM.

Results: At baseline high levels of HbA1c and post-prandial glycemia (PG)

were registered. At conception these indices decreased in Gr.1, while in Gr.2 this decrease was achieved only in the 2nd trimester (tr), and in Gr.3 and 4 in the 3rd tr. In Gr.1 pre-eclampsia(PE) and pre-term delivery (PTD) percent was lower than in the remaining three groups (PE - 4.4%, 12.0%, 26.4% and 24.4% respectively, PTD - 1.4%, 9.6%, 23.5% and 24.4%, respectively). Retinopathy progression was observed only in 8.1% of patients from Gr.3. In Gr.1, despite the lower levels of HbA1c and PG throughout the pregnancies, the percent of macrosomia was higher than in Gr.2 and 3 (16.07%, 12.1% and 15.3%, respectively). The rate of spontaneous abortions was lower in Gr.1 (4.4%) than in Gr.2 (13.4%). Perinatal mortality (8.8%) and fetal malformations (5.8%) were registered only in Gr.3. Two cases of perinatal deaths were registered in Gr.4.

Conclusion: In patients with Pre-GDM and GDM good glycemia control during pregnancy not always prevents macrosomia, though significantly reduces the risk of spontaneous abortions, pre-eclampsia, preterm delivery, fetus malformations and perinatal deaths. No retinopathy progression is observed when women are well-controlled throughout their pregnancies.

No conflict of interest

O-0092

Comprehensive approach towards paediatric diabetes management: NGO initiatives in developing country India

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Issues: In developing nations diagnosis of diabetes brings mental-trauma/depression in family. Focused treatment for pediatric age-group is unavailable in developing-countries. 26% of diagnosed diabetics are children. Adequately trained physicians/nurses in issues of pediatric-diabetes provide continuity of care, relief from depression and smooth transition from diagnosis to treatment. Qualitative collaborative relationship between these makes diabetics life bearable. Our NGO-project highlights significance of relationship between nurses and diabetic-children in community clinic setup of rural India.

For Diabetes, its assumed that depression is inevitable sequel to diagnosis. Retrospective analysis of past studies shows—counselling improves QOL & attitude towards diabetes-treatment.

Aims: To describe care issues in diabetic-children. Observe/modify nature of relationship between nurse and child. To evolve comprehensive treatment plan for patients and families.

Methods: A retrospective analysis of data base from 7 rural health-clinics. Specialized therapy/support to pediatric-age-group not available at any centre. Total 117 children [4-13 years] diagnosed with diabetes. 23 had additional endocrine/metabolic problems. Nursing/medical care plan analyzed. No specialized trained personnel in rural/tribal India. Opinion/needs from patients families collected on feedback questionnaire. Then we trained 10 nurses & 2 physicians for handling pediatric cases [4 weeks training].

Results: out of 117, 41 discontinued Rx due to improper counseling/guidance. 3 died. Patient/family's feedback highlights: Better access to newer drugs-delivery-systems, psychosocial support, follow-up-plan. Nurses/physician be sensitized in pediatric care-issues. Main issues of concern were: [1] illness and coping with their feelings. [2] Initial impact of diagnosis and a search for solution? Expectations for future life & its quality? [3] Concerns of cost of RX [4] Availability of proper follow-up centers in rural areas of developing nations.

Conclusion: Multifaceted Relationship between physician/nurse and Diabetic-child is crucial. This relationship provides better continuity of treatment. We show concerns/difficulties while working in Asian set-up to international experts/seniors at IDF-2009-congress.

No conflict of interest

O-0093

Diabetes and pregnancy

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Success of a diabetic pregnancy depends on the quality of pregnancy planning and good regulation of diabetes. This program is trying to work educationally for two groups of diabetic females: those who get pregnant unexpectedly and those who avoid pregnancy because they are not aware of progress in this field. It takes a lot of work to raise awareness about the complications and risks in the event of inadequate glucose regulation and the incredibly good results if a person approaching pregnancy is well prepared and on time. Doctors don't have enough time to devote themselves to each pregnant woman and answer all their questions during their working hours. Therefore, many mothers are confused during their first pregnancy and have a number of unanswered questions. So we tried to organize different approaches in explaining the problem and solving future mother's dilemma. This program is trying to reduce the high cost of treatment due to complications arising from poor regulation of diabetes and is trying to raise awareness of the opportunities of people with diabetes and to lift stigma that diabetes is a big limitation.

The program consists of a lecture on the topic: "Ideal Diabetic Pregnancy" in which doctors explain what is recommended to do before conception in order to drastically increase the chances for bringing a pregnancy to a full term, and what to do in case of an unplanned conception.

Psychological workshops follow after on the topic: "Expectations, fears and facing with pregnancy," which explains that some fears can be useful and constructive, and same which are irrational can reduce the quality of life in such a beautiful period of pregnancy.

Very popular topic "To store stem cell or not?" is presented in the form of a round table discussion which gives insights on the benefits of storage of stem cells from the umbilical cord and also debates about additional reasons for diabetic mothers whether to store stem cells or not.

And perhaps the most important activity for all future mothers is to visit the Department for pregnancy diabetes in the hospital in which future mothers get familiar with the surroundings and staff. Previously there has not been such an insight for diabetic mothers and other future mothers in the Republic of Croatia.

Future mothers who go through this program, resolve their fears and concerns, and bravely decide to get pregnant because of new knowledge and information they have gained. Fortunately for those women they have a great chance of bringing a pregnancy to a full term.

No conflict of interest

ORAL PRESENTATION

CLINICAL RESEARCH

Inflammation and diabetes

O-0094

Resistin-induced expressions of visfatin and inflammatory cytokines in endothelial-macrophage co-culture model through NF-kappaB pathway

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Aims: To investigate whether resistin, secreted from adipocytes and macrophages, can directly upregulate visfatin, inflammatory cytokines and adhesion molecules in endothelial/macrophage co-culture model.

Methods: Human umbilical vein endothelial cells (HUVECs) were co-cultured with macrophage (PMA-stimulated THP-1 cells) and stimulated with resistin (100 ng/ml) for up to 24 h. mRNA and proteins expression of visfatin, inflammatory cytokines (MCP-1, IL-6 and IL-8) and adhesion molecules (ICAM, VCAM and E-selectin) were determined by Real-time PCR and western blot. NF-kB activity was measured by Electrophoretic Mobility-Shift Assays (EMSA).

Results: We found that resistin upregulated mRNA and protein expressions of visfatin, inflammatory cytokines (MCP-1, IL-6 and IL-8) and adhesion molecules (ICAM, VCAM and E-selectin) in endothelial/macrophage co-culture models at 24 h (all $p<0.05$). Resistin treatment resulted in activation of NF-kB in HUVEC, which further increased significantly when co-cultured with HUVEC and macrophage.

Discussion/conclusion: Resistin induced visfatin, inflammatory cytokines and adhesion molecules mRNA as well as proteins expressions in HUVECs/macrophage co-culture system, probably through activation of NF-kB activity. We suggest that resistin may play certain role in links between obesity, inflammation and endothelial dysfunction.

No conflict of interest

O-0095

Asymmetric dimethyl arginine (ADMA) levels are associated with macrovascular disease but not inflammation in type 2 diabetes

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Aim: We aimed to determine the relation of asymmetric dimethyl arginine (ADMA) levels to atherosclerotic vascular disease and inflammation markers in type 2 diabetes.
Methods: Fifty type 2 diabetic patients with established atherosclerosis, 50 type 2 diabetic patients without atherosclerosis and 31 healthy control subjects were included in our study. Age, sex, blood pressure levels, duration of the diabetes, treatment types of the patients were recorded. Carotid artery intima-media thickness of each subject were measured. Fasting blood samples were drawn and fasting blood glucose, C-peptide, creatinine, lipid levels, hcCRP, fibrinogen, erithrocyte sedimentation rate, adiponectin, homocysteine(tHcy) and ADMA levels were studied. We evaluated the relationship between ADMA levels and tHcy, adiponectin, inflammation markers and macrovascular disease.
Results: ADMA levels were significantly higher in patients with macrovascular complications than the patients without macrovascular complications (0.52±0.23 mmol/L vs.0.39±0.16 mmol/L,p<0.05) and the control group (0.52±0.23 mmol/L vs.0.32±0.13 mmol/L,p<0.05). In addition, when we compared all of the diabetic patients with control group, we found that ADMA levels were significantly higher than the control group (0.45±0.21 mmol/L vs. 0.32±0.13 mmol/L, p<0.001). Adiponectin levels and homocysetine levels were the most important determinants of ADMA in the presence of macrovascular disease. We could not find any relationship between ADMA levels and inflammation markers.
Conclusion: There is a relationship between ADMA levels and macrovascular disease in type 2 diabetes but, this relation is independent of inflammation. Adiponectin levels are significant determinators of ADMA levels in type 2 diabetic patients.

No conflict of interest

O-0096

Plasma nitric oxide metabolite (NOM) concentrations are elevated in the obese and type 2 diabetics and are suppressed by insulin

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We have recently shown that endotoxin injection leads to a rapid increase in plasma NOM concentrations as a part of the acute inflammatory response in normal subjects. In view of the chronic low grade inflammation which exists in patients with obesity and type 2 diabetes mellitus (T2DM), we hypothesized that NOM concentrations are elevated in these conditions. Since insulin exerts an anti-inflammatory effect, we also hypothesized that insulin suppresses NOM concentrations. Plasma NOM concentrations were measured in the fasting blood samples from normal subjects, obese and T2DM patients (24 each) using the Griess reaction. In the second study, a low dose (2U/h) of insulin and 5% dextrose (100ml/h) were infused into 10 patients with T2DM for 4h. Either 5% dextrose or normal physiological saline was infused on 2 other occasions as controls. Plasma concentrations of NOM were significantly higher in the obese (by 59%) and T2DM patients (by 52%) compared to normal subjects (43±4 vs. 41±3 vs. 27±3 mM, respectively P<0.05). Following insulin infusion, plasma concentrations of NOM fell by 34±15% at 4h (P<0.05). This suppression occurred in parallel with reductions in ROS generation by peripheral blood mononuclear cells (MNC) and plasma MCP-1 concentrations. There was no significant change in NOM concentration or other inflammatory indices following dextrose or saline infusions. iNOS either as mRNA or protein was not detected in MNC. The source of NO is, therefore, probably the macrophages in the reticulo-endothelial system in the liver and the spleen. We conclude that plasma NOM concentrations are significantly elevated in obesity and T2DM and that a low dose insulin infusion suppresses the elevated levels significantly in parallel with a reduction in indices of oxidative stress and inflammation.
Table 1: Change in inflammatory and oxidative stress mediators following 2U/hr insulin/ dextrose infusion in T2DM (n=10) *:P<0.05 One-way ANOVA, #:P<0.05 Two-way ANOVA compared to dextrose control group.

	0h	2h	4h	6h
Insulin (µU/ml)	20.1±3	50.5±8*#	43.8±9*#	24.8±4
NOM (µM)	56±3	49±8	38±6*#	47±3
ROS generation (%)	100	95±6	82±*#	112±9
MCP-1 (ng/ml)	270±40	233±30*	225±29*#	282±41

No conflict of interest

O-0097

Insulin infusion suppresses endotoxin induced oxidative, nitrative and inflammatory stress in normal human subjects

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Our work over the past few years has demonstrated that insulin exerts anti-inflammatory and cardio-protective effects. We have now hypothesized that insulin reduces the magnitude of oxidative, nitrative and inflammatory response induced by endotoxin (LPS). Nine normal subjects were injected with 2ng/Kg of LPS prepared from ***E. coli*** intravenously. Ten others were infused with insulin (2U/h) for 6h in addition to the LPS injection along with 100 ml/hr of 5% dextrose co-infused with insulin to maintain normoglycemia. LPS injection, induced an increase in body temperature, pulse rate, body aches and headache. The subjects also exhibited a rapid increase in plasma concentrations of nitric oxide metabolites (NOM), nitrite and nitrate, TBARS, increase in ROS generation by PMNL and marked increases in plasma FFA, MIF, TNFa and IL-6 concentrations (Table 1). The co-infusion of insulin led to significant reduction in body temperature (100.3 vs. 101.3 F, p< 0.005) and headache, a total elimination of the increase in NOM, FFA, TBARS and a significant reduction in ROS generation by PMNL and plasma MIF concentrations (Table 1). However, insulin did not affect TNFa and IL-6. Thus, insulin reduced clinical symptoms, oxidative, nitrative and inflammatory stress as induced by LPS. Insulin is a potential rational anti-inflammatory therapy for endotoxemia.
Table 1: Changes in oxidative and inflammatory mediators following 2ng/Kg injection of LPS alone (TOP row) or LPS and 2U/hr insulin (BOTTOM row) for 6 hr in normal healthy subjects. *:One-way ANOVA, #:Two-way ANOVA.

See Table 1

No conflict of interest

table 1

Marker\Hours	0	1	2	6	24	P*	P#
Glucose (mg/dl)	89.9±2.4	88.6±4.5	85.5±4.9	84.5±3.3	86.6±3.0	NS	NS
	85.7±2.2	81.4±5.3	82.9±3.2	80.2±4.8	85.6±2.5	NS	
Insulin (µIU/mL)	6.4±1.4	7.4±1.6	7.2±1.2	5.9±1.1	13.1±2.2	NS	0.001
	7.5±1.5	30.5±5.1	24.9±4.2	28.9±4.8	16.7±3.0	0.004	
TBARS (% change)	100	287±33	130±8	131±14	109±9	0.017	0.003
	100	118±13	116±9	126±13	114±9	NS	
Free Fatty Acids (FFA) (mM)	0.35±0.05	0.28±0.04	0.51±0.09	0.82±0.12	0.32±0.09	0.012	0.024
	0.29±0.08	0.11±0.02	0.16±0.06	0.36±0.08	0.31±0.07	0.005	
Nitrate/Nitrite (µmol/L)	29.4±2.6	38.5±4.7	47.7±5.4	35.7±4.2	30.5±2.6	0.006	0.001
	32.6±2.7	30.2±2.0	26.9±2.4	29.3±3.8	31.5±1.9	0.012	
PMN ROS Generation % change	100	310±35	110±18	263±41	148±25	0.001	0.02
	100	164±23	55±8	228±35	206±37	0.004	
MIF (pg/ml)	727±111	1056±133	1003±117	1345±145	828±138	0.008	0.028
	713±102	700±137	863±127	1080±87	885±139	0.027	

O-0098

Anti-inflammatory effect of the CB1 receptor antagonist SR141716 on human mature adipocytes and its effect on human preadipocytes differentiation

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Introduction: Obesity has become a major public health problem and could lead to diabetes type II, atherosclerosis, hypertension, hepatic steatosis, and sometimes cancer. The accumulation of fat in tissues leads to local inflammation characterized by increased proinflammatory cytokines such as TNFalpha. This inflammation is probably one of the most important factors for the development of insulin resistance.
The purpose of this study was to show the effect of CB1 receptor antagonist on human fat cells in primary culture, preadipocytes and mature adipocytes. We have studied the effect of SR141716 (Rimonabant or Acomplia) on the adipocyte differentiation and secretion of TNFalpha and adiponectin by mature adipocytes.
Materials and methods: Subcutaneous (abdominal, buttocks, hips and thighs) tissue samples of human white fat were obtained from normal weight or slightly overweight women undergoing liposuction. Cultures were done as previously described (Gonthier 2007). Moreover, stromal vascular cells were extracted and differentiated into adipocytes. Media samples and cells were collected for secretory and expression analysis. Oil accumulation in adipocytes was observed using oil red-O staining. We measured the change in secretion levels of various molecules secreted by ELISA. Gene expression was measured using RT-PCR.
Results: When mature adipocytes were treated with LPS, SR141716 was able to decrease the expression and secretion of TNF alpha in a significant manner (around 30%) suggesting an anti-inflammatory role of this molecule. Moreover, SR141716 restored adiponectin secretion to normal levels after LPS treatment. When preadipocytes were treated with SR141716, no changes could be observed on differentiation of these cells.
Discussion/conclusion: TNF alpha is known to be an inflammatory cytokine, highly correlated with insulin-resistance. In contrast, adiponectin has benefit effects on metabolic parameters (as glucose uptake, for example). We show for the first time that SR141716 is able to act directly on human adipocytes through an anti-inflammatory effect. In other words, some clinical effects of SR141716 are probably directly related to its effects on mature adipose cells.
CB1 receptors play an important role in adipocyte physiology and thus can contribute to metabolic syndrome. Understanding the interaction between this receptor and TLR4 (LPS pathway) in adipocytes will help us in better understanding of this metabolic syndrome.

No conflict of interest

O-0099

Expression and fuction of CD39 and P2X7 receptor in patients with type 2 diabetes mellitus

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Type 2 Diabetes Mellitus (T2DM) is a polygenic and multifactorial disease with multiple genetic loci associated with the risk of T2DM. Chronic low-level inflammation plays a role in pathogenesis with several pro-inflammatory cytokines (TNFa, IL-6), lipid, reticulum endoplasmic stress and reactive oxygen species involved. In this regard, recent data suggest that the pro-inflammatory receptor P2X7 could be associated with T2DM. It has been reported that the P2X7 receptor modulates release of cytokines (IL-1ß, TNFa, IL-1ra, IL-6) and demonstrates an enhanced P2X7 activity in fibroblast from T2DM patients and also in human fibroblasts from healthy subjects exposed to hyperglycemic conditions. In contrast, CD39/ecto-NTPDase 1 (nucleoside triphosphate diphosphohydrolase 1) is an ecto-nucleotidase expressed primarily on activated lymphoid cells, that is involved in a low release of IL-1ß, and its deletion in mice (CD39/Entpd1-null mice) induces insulin resistance. Because high level of extracellular nucleotides ligand of CD39 and P2X7 receptor are released by several different cells to extracellular milieu upon cell and tissue damage, in this study we propose the activation of P2X7 receptor by its ligand ATP and the function and expression of CD39 in lymphocytes and monocytes from patients with T2DM participate in the pathogenesis of low grade inflammatory process and insulin resistance.
Results: In the present study, we include 12 patients who were subsequently diagnosed with T2DM, without complications (retinopathy, neuropathy, and nephropathy) and 8 healthy subjects (FPG < 100mg/dL). We detected a significant diminished expression of CD39 in mononuclear cells and in particular in CD4+ T lymphocytes in patients with T2DM compared with healthy subjects. However, subpopulations like CD8+CD39+, CD56+CD39+, CD19+CD39+ and CD14+CD39+ showed similar levels of expression in patients and healthy subjects. In contrast, we observed a significant enhanced P2X7 expression in CD14+ cells from patients with T2DM than in healthy subjects. However, peripheral blood mononuclear cells and other subpopulations like CD56+P2X7+, CD8+P2X7+ and CD19+P2X7+ we detected similar level between groups studied. Cell surface receptors were analyzed with flow cytometry and serum inflammation markers with enzyme-linked methods. Finally, we found that one of the functions attributed to P2X7 receptor upon bind to ATP ligand, like diminished levels of CD62L in lymphocytes, were similar in lymphocytes from patients with T2DM and healthy subjects. To determine the ATPase activity of CD39, we measured the amount of orthophosphate released by hydrolysis of ATP in mononuclear cell cultures and did not detect difference between groups.
Conclusion: Based on our data, we hypothesize that the increased expression of P2X7 receptor and diminished CD39 expression could be contributing to pathogenic inflammatory process observed in T2DM.

No conflict of interest

O-0100

Pro/anti-inflammation cytokines and acute phase proteins in type 2 diabetics with essential hypertension or its association with cardiovascular disease

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Insulin resistance (IR) is an important component of such chronic pathologies as type 2 diabetes mellitus (T2D), essential hypertension (EH), cardiovascular disease (CVD) and metabolic syndrome (MS). There is a theory putting IR in touch with inflammation within evolutionary development and emphasizing role of tumor necrosis factor-a (TNF-a). The aim of the study was to evaluate the circulating levels of acute phase proteins, pro/anti-inflammation cytokines including TNF-a, and their relationship with metabolic and hormonal parameters of IR in T2D patients with EH alone or combined with CVD.
Methods: 29 middle-age patients with T2D and MS (NCEP ATP III), dysglycemia, dyslipidemia, obesity, EH or its association with CVD were observed. Blood samples were collected repeatedly within 6 mo (n=60). 26 samples belonged to T2Ds+EH, 34 – to T2Ds+EH+CVD. 27 healthy volunteers served as controls (C). Index of IR was calculated using HOMA. Unpaired Student's t test, Wilcoxon-Mann-Whitney test, X^2 test, and Spearman's rank order were used.
Results: It was revealed a significant increase in circulating acute phase proteins (C-reactive protein, $p<0.001$; haptoglobin, $p<0.05$; ferritin, $p<0.001$) without any relation to complication type in T2Ds with chronic hyperglycemia. HOMA-IR was increased as compared to C ($p<0.001$) and had no differences between diabetic groups. Interestingly, that increase in TNF-a levels was more pronounced in T2Ds with EH compared to EH+CVD group (7.62 ± 1.98 vs 4.11 ± 0.35 ng/l, $p=0.045$, 1.73 ± 0.46 ng/l in C, $p<0.001$). It was accompanied also by more pronounced decrease in circulating adiponectin (EH vs EH+CVD: 8.5 ± 0.8 vs 11.6 ± 0.9 mg/l, $p<0.02$, 15.1 ± 1.5 mg/l in C, $p<0.01$). There were many correlations between studied indices and metabolic or hormonal parameters of IR.
Conclusions: We suggest modulating effect of poor glycemic control on low-grade inflammation parameters and their association with IR in T2Ds with EH and CVD. In our opinion it is necessary to elucidate the causes of less pronounced TNF-a level increase in T2D hypertensive patients with CVD compared to diabetics with EH alone against the background of similar diabetes and hypertension duration, IR, glycemic control and extent of obesity.

No conflict of interest

ORAL PRESENTATION

ASSOCIATION DEVELOPMENT

National plans to optimize diabetes care

O-0101

Assessing the impact of conducting an essential public health services assessment in diabetes prevention and control programs

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Aims: To discuss the Essential Public Health Services assessment, the importance of completing in DPCPS and how this can lead to quality improvements in diabetes care.
Background: The goal of the Essential Public Health Services (EPHS) assessment is to promote continuous quality improvements. In 2002, the Division of Diabetes Translation (DDT) recommended that state Diabetes Prevention and Control Programs (DPCPs) complete an EPHS assessment and use the findings of this assessment to develop a state Performance Improvement Plan/s (PIP) and a Diabetes Strategic Plan.
Methods: DPCP data submitted to the DDT's Management Information System (MIS) were reviewed using several evaluation criteria, including the completion of an EPHS assessment; completion of one or more PIPs; completion of a diabetes strategic plan addressing quality improvement issues identified during the assessment; and a review of how current DPCP efforts, as described in their work plans, aligned with the findings of the assessment.
Results: MIS searches revealed that, in 2008, 58 of 59 DPCPs (98%) completed an EPHS assessment. Three DPCPs used the original EPHS assessment; fifty six (56) DPCPs used a modified version. By 2005, 39 of 59 of DPCPs (66%) completed a (PIP), and by 2008, 90% of programs have completed at least one PIP. Additionally, two programs completed more than one PIP during the five year funding period.
An analysis of the top three priorities identified by all DPCPs during the assessment revealed several quality improvement themes such as: health systems improvement, partnerships, surveillance, prevention and wellness, advocacy and policy, professional education and trainings, disparities, evaluation, and communication. Other priorities included community programs, research promotion, assessment and planning, integration, systems approach to diabetes, social marketing and health care reform. In 2005, 61% of all funded programs had a diabetes strategic plan in place and that number rose to 85% in 2008. In 2008, analysis of MIS reports and a review of current work plan templates indicated that more than 85 % of the work of the DPCPs showed direct alignment to the EPHS assessment findings.
Discussion/conclusions: Conducting EPHS assessments and using the data for continued quality improvement activities can have significant impact on DPCPs. This assessment allowed states to identify priority areas and assisted in the development of work plans to address quality improvement concerns. The alignment of the DPCP work plans to the findings of their EPHS is critical in ensuring that DPCPs work to address gaps, and work to strengthen the diabetes public health system. DDT will need to continue to work with DPCPs to ensure that work plans are aligned with the EPHS assessment findings, so that critical gains can be maintained across the diabetes public health system.

No conflict of interest

O-0102

Statewide implementation of the Chronic Care Model for Diabetes: a model for improving care across a diverse region

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Aim: The primary care system, where most of diabetes care is provided, is insufficiently oriented toward the management and maintenance of those with chronic illnesses such as diabetes. The Chronic Care Model (CCM) provides the best evidence-based framework to transform this care from an acute and reactive system to a proactive, planned and population-based system of care. To date, however most implementations of the CCM have been in larger practice organizations due in part to unsupported reimbursement for chronic care elements and a mismatch between those who bear the implementation costs and those who potentially receive the financial benefit within the US health care system. The goal of this three year intervention was to align financial resources, health care providers, and patients to implement the CCM across Pennsylvania (PA), a large diverse US state (117,000 sq km) with a population of 12 million including 800,000 with diabetes.
Methods: In 2007, multi-stakeholders from across the State developed a blueprint for how efforts, resources and interests could be combined to strengthen the collective capacity to improve diabetes care. This initiative coincided with the PA Governor's establishment of the Chronic Care Commission, charged with implementing the CCM across the State with a focus on diabetes. Implementation of the CCM is being driven by significant practice incentives supported by insurers aligned with the Patient Centered Medical Home. Regional Learning Collaboratives are supported by a free (state-supported?) diabetes registry, monthly data reporting requirements, regular meetings and trained practice coaches working individually with primary care practices.
Results: Learning Collaboratives have occurred across different regions of the state; each engaging approximately 25 practices of various sizes with diabetes populations of roughly 5000 per collaborative. The first of these collaboratives (Philadelphia region) has completed one year of the intervention with monthly reporting of outcomes. Considerable practice changes have been implemented in Clinical Information Systems, Delivery System Design and Decision Support and have recognized the central role of Self-Management Support and Community partnerships to improve care. Several clinical measures and process measures have already improved.
Conclusion: This unique undertaking, in one of the US's largest states, merging for the first time changes in reimbursement with incentives for CCM implementation, holds significant promise to transform health care in other regions and establishes a potential national model for systematic chronic disease management.

No conflict of interest

O-0103

Staged diabetes management ISSSTE: The First National Diabetes Program in Mexico

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Introduction: Diabetes has become the first cause of mortality in Mexico. Leading contributing factors include lack of coverage/access to care, deficiencies in training of general practitioners and specialists, persistence of the acute model for chronic disease care, a vertical prescriptive approach, abscence or denial of diabetes self care education by practitioners, institutions and medical societies
Objectives: 1) To achieve a 20 percent reduction in mortality due to diabetes by 2011; 2) develop a high quality model of outpatient diabetes care; 3) increase national coverage/access to diabetes care; 4) reduce the rate of acute complications; 5) reduce the rate and the progression of chronic complications; 6) reduce direct costs of diabetes; 7) improve the quality of life of persons with diabetes; 8) introduce self-care diabetes education as an essential component of the program
Diabetes Program at ISSSTE Starting in 2007, implementation of Staged Diabetes Management, a structured program developed by the International Diabetes Center, a WHO Collaborative Center from Minneapolis MN, began at ISSSTE, a social security provider with an affiliation of almost 11 million people with national coverage in Mexico. Multidisciplinary teams were established at each clinic, including general practitioners, nurses, dietitians, psychologists and social workers. Healthcare delivery was improved to reduce waiting times, rotation of staff, and to increase the time for baseline and follow-up visits. Resources were devoted to provide all the clinics with A1c measurements and medications, online continuing education is delivered every month, and an electronic file was created to receive information in real time.
Results: At the first quarter of 2009, 89 diabetes clinics have been established in every state of the country, in which 7,902 patients are currently treated. Acceptance of the program has been universal, and has led to introduction of

additional programs for chronic disease care. Improvements in glycemic control have been documented, with 59.2 percent of the patients achieving A1c levels below 7%.

Conclusions: Less than two years after its creation, the National Diabetes Program at ISSSTE is the largest in Mexico. Milestones include: 1) real, effective national coverage; 2) multidisciplinary approach; 3) a patient centered approach, active participation of patients and their families; 4) the first national program in Mexico to use A1c measurement as marker of glycemic control; 5) the first electronic chart of diabetes in the country; 6) introduction of self-care diabetes education as an essential component of the program. According to UKPDS estimations, the levels of glycemic control achieved in patients treated at ISSSTE, are in concordance with the main objective of the program, a 20 percent reduction in mortality by 2011.

No conflict of interest

O-0104

The Australian Diabetes Map

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The Australian Diabetes Map is an Australian innovation that provides a virtual picture of the nation's diabetes population. It is a national resource to key decision makers but most importantly to local communities. It can drill down to a defined geopolitical boundary at federal, state and local government level. The map shows prevalence of diabetes together with age, gender and type of diabetes. It also shows the location of health services including hospitals and pharmacies. People accessing the map can make diabetes prevalence comparisons between their local communities and the national average.

It has the potential to better inform politicians, policy makers, health professionals and researchers about the prevalence of all types of diabetes. This will in turn assist health service planning by identifying 'hot spots'; population health interventions by identifying the type of diabetes; post intervention monitoring and surveillance. Understanding how, where and to what extent diabetes affects our community is critical in delivering effective management and prevention strategies.

Using Microsoft's Virtual Earth technology as its platform it is linked to the National Diabetes Service Scheme (NDSS) database which has over 900,000 people registered. The NDSS captures nearly 95% of all Australians diagnosed with diabetes. An Australian Government initiative, the NDSS offers subsidised products, information and support services to people registered under the Scheme.

The NDSS is unique and the only one of its type internationally. It contains information about the registrant including name, age, home address and type of diabetes and if requiring insulin. The types of diabetes registered on the NDSS closely reflect the population statistics for diabetes in Australia.

The map is being developed further to include locations of general practices and primary health care facilities, location of diabetes educators and specialist diabetes centres. The technology underpinning the map has the potential to layer a range of demographic and social indicators to the landscape that will further enhance our understanding of the epidemiology and behavioural science of diabetes. For Diabetes Australia, the map will be a valuable addition to our tool box of strategies to ***turn diabetes around***. It can be accessed at: www.diabetesmap.com.au.

No conflict of interest

O-0105

National registry of diabetes mellitus in Uzbekistan

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Aims: Recent epidemiology studies shown that number of Diabetes Mellitus (DM) complications not enough observed and not registered in patient cards, especially in early stages, life expectancy of children after diagnosis of disease was about 8 years in 1998. Creation of National Registry of DM (NRDM) in Uzbekistan should improving registering all patients with DM and help to view all inaccuracy and mistakes and improve the diabetes care. The aim of our investigation was evaluation decisions of the NRDM during the past 8 years.

Methods: Electronic data base with all DM patient data was created and updated every 3 years and all data was undergo to statistical analysis and compare year by year and with epidemiology data.

Results: In start of 2008 104005 patients card with DM were registered, 974 children and 444 adolescents were among them and 17958 patients with type 1 DM. After NRDM, mortality was decreased among children on 60% and among adolescents on 75% and leading cause of death among children and adolescent is end stage of renal disease (ESRD), but 10 years ago - was ketoacidosis and coma. During the NRDM was improved insulin therapy, quantitative – increased adequate doses of insulin and qualitative – more than 75% of patients turn to intensified insulin therapy. According to NRDM, observation and registration of diabetes microvascular complication are increased and vary for nephropathy from 12.3% to 61%, retinopathy - from 12.3% to 64%, after NRDM attention to arterial hypertension increased and variation depended from regions and registered from 12.5% to 25.1% of patients. Analysis NRDM data shown that registration the macrovascular complications among patients was not enough and registering the coronary heart disease vary from 4% to 12.5% and atherosclerosis from 4.2% to 13%, and lipids test was done only by total serum cholesterol in 46.7% patients, which cause for limitation for using antilipidemic drugs – in 8.4-30%.

Conclusion: Creation of NRDM are very helpful for determination of inaccuracy and permit to reduce mistakes and improving the diabetes care and life of people with diabetes both in quantitative and qualitative.

No conflict of interest

O-0106

Improving the diabetes management capacities of health care providers in Indonesia

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Aims: To improve the capacity of preventing, detecting and treating diabetes among health care providers in Indonesia.

Methods: The activities were parts of a project named Improving Diabetes Health Care Delivery in Indonesia which initiated by Indonesian Society of Endocrinology in-cooperation with Ministry of Health with support from World Diabetes Foundation. Between January 2007 until June 2008 several trainings on diabetes management for internist, primary care doctors and diabetes educators were conducted in 8 centers (Jakarta, Medan – North Sumatera, Padang – West Sumatera, Bandung – West Java, Yogyakarta, Surabaya – East Java, Denpasar – Bali, and Makassar – South Sulawesi). Trainings materials including trainings modules, guidelines on diabetes management, and materials for education were developed prior to the trainings. Follow-up meetings among trainings' participants were conducted to assess the implementation of knowledge and skills achieved through the training and its obstacles in their respective health facilities. The meetings also attended by various stakes holders in diabetes management including local health officers.

Results: A total of 1237 health service providers consisted of 125 internists, 539 primary care doctors, 573 diabetes educators were trained. Proportion of hospitals which provide diabetes education for the patients change from 52.8% to 67.7% after the training while for primary health centres change from 46.3% to 67.8%. Addition of three hospitals and 14 primary health centres with special services (clinic) for diabetes were also achieved as a result of the training.

Conclusion: The specific projects' design have some advantages in improving the capacity of preventing, detecting and treating diabetes and reduce the burden of diabetes in the Indonesian society through resolving some of the problem on human resources in Indonesia. Through this project, communication and close interaction between the primary and secondary health practitioners take place and the local health officers realized the burden of diabetes in their area.

Conflict of interest:
Other substantive relationships: I Widyahening is project coordinator of Indonesian Society of Endocrinology
S. Soegondo is former president of Indonesian Society of Endocrinology
P. Soewondo is current president of Indonesian Society of Endocrinology

O-0107

A guide for needs assessment and situation analysis in response to diabetes in resource-limited settings

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Introduction: IDF and WHO estimated that 80% of the 380 million of diabetic people will live in the developing countries in 2025 and that 20% to 50% of them would be disabled. Handicap International and local partners are currently developing projects in response to this diabetes epidemic in 8 resource-limited countries. The aims of these projects are to prevent the occurrence of disabilities related to diabetes and to mitigate the disabling situation of diabetic people living with complications.
In order to define the most relevant activities to improve the response to diabetes in a given area, before implementing any activity, the first step is to assess the local needs and the available resources. To help local stakeholders in doing this first step, Handicap International has adapted existing guides of situation analysis to diabetes issues.
Aims: To design a methodological guide to assess the needs, demands and resources available and to choose the most relevant intervention strategies in response to diabetes epidemic in a given area of a resource-limited country.
Methods: The process has first defined the necessary characteristics of the guide regarding specific constraints of limited-resource countries. It should be adaptable, flexible and user friendly. It should not be too time consuming, and should lead to affordable activities. All steps should be described from information gathering to data analysis.
Then, we conducted a literature review on the methodologies for situation analysis, needs assessment, rapid appraisal and programming in public health. We analysed them according to their weaknesses and forces regarding the objectives and characteristics of the guide.
Next, we looked for the specificities of diabetes issues in term of public health by conducting another literature review on health structures evaluation, quality of care assessment and diabetes management. According to the objectives of the guide and to the identified specificities of diabetes, we adapted the existing methodologies of needs assessment to diabetes issues. The guide has been tested in 5 different countries of Africa and Asia and improved according to the weaknesses identified during these tests.
Results: A methodological guide of needs assessment and situation analysis in response to diabetes in limited-resource countries has been developed, including 14 steps and 9 tools (interview guides, observation grids, report framework, etc.)
Conclusion: The needs assessment and situation analysis guide in response to diabetes in limited-resource settings is a useful tool to build a relevant project that fits to the needs of local population.

No conflict of interest

OPEN FORUM

LIVING WITH DIABETES

Awareness and education through skits/song/dance/mime

0108

Awareness and education through skits/song/dance/mime

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A didactic style of teaching has been used and over used to teach diabetes education. There are many other ways of imparting knowledge that are equally if not more effective and, which address the cultural problems educators face in a multicultural society.
Entertainment is a powerful tool and there are many ways of educating through entertainment including, storytelling, puppet shows, song, mime and music.
The aim of this presentation is to show that diabetes education can be delivered through creative avenues and be highly effective. Diabetes education is perceived as the imparting of knowledge and as such connotes a somewhat dry and boring delivery. This presentation aims to prove the opposite and that diabetes education can and should be fun.
The presentation will be given using a variety of educational tools including story telling songs and puppets.

No conflict of interest

MEET-THE-EXPERT

HEALTHCARE AND EPIDEMIOLOGY

Revising the diagnostic criteria for diabetes; the 2009 WHO/IDF initiatives

0109

Revising the diagnostic criteria for diabetes; the 2009 WHO/IDF initiatives

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The diagnostic criteria for diabetes has been a process of evolution and the question now is whether we need a revolution, or at least, a revaluation. The debate as to the appropriate classification and criteria for diabetes mellitus is not a new one. Despite some apparent international consensus in the last decade, it still continues with vigour. Earlier attempts to classify diabetes were considerably enhanced by Himsworth's important observation in 1936 that there appeared to be two categories of diabetes, insulin sensitive and insulin insensitive. These terms preceded those subsequently used, "juvenile-onset" and "maturity-onset" diabetes mellitus. The validation of Himsworth's original observation came with the development of a bioassay for plasma insulin, and the demonstration by Bornstein and Lawrence that the presence or absence of insulin in plasma allowed the differentiation of two discrete entities – true insulin-deficient diabetes and a second form where either low, normal or high insulin levels were found. Subsequently, over the last several decades, the National Diabetes Data Group (NDDG), the World Health Organization (WHO) Expert and Study Groups on Diabetes Mellitus, and the International Diabetes Federation have attempted to come to grips with the classification of diabetes and other states of glucose tolerance. However, if we accept that there are two major forms of diabetes - type 1 and type 2, then we need to decide whether the current classification is both appropriate and satisfactory? In general, it is reasonable to say that there is dissatisfaction, as the classification may not adequately cover or satisfy aetiological, pathogenetic or clinical aspects. In addition, there is considerable debate about the use of the term prediabetes. If we accept that the risk of CVD in relation to plasma glucose is continuous, if there is no threshold, then are the current diagnostic cut-off points which are based on threshholds for retinopathy appropriate? There is a move to introduce HbA1c as a diagnostic test for diabetes. There is mounting evidence that this is appropriate, although there will be many developing nations and disadvantaged communities where it is not affordable or feasible.

No conflict of interest

MEET-THE-EXPERT

FOUNDATION SCIENCE

Exercise and insulin sensitivity: mechanisms and potential

0110

Exercise and insulin sensitivity: mechanisms and potential

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Skeletal muscle is an extremely flexible organ and adapts immediately to changes in usage. In response to exercise and contraction, skeletal muscle also becomes more sensitive to insulin, and thus physical activity is recognised as both a preventative and therapeutic strategy for treatment of insulin resistance

and type 2 diabetes. These changes are reversible, and thus the opposite effects are noted in response to inactivity. A key question is how these changes are initiated and coordinated at the level of gene transcription, and whether there is a "master" exercise-activated signal. The extent of adaptive changes depends both on the nature and quantity of the demand placed on the muscle. While single bouts of exercise merely alter gene expression transiently, repeated bouts of exercise lead to a range of longer lasting adjustments. Several signalling pathways are activated in direct response to muscle contraction. These include the mitogen activated protein kinase cascades, hypoxia, AMP kinase and Calcium activated signalling events.
This lecture will focus on exercise-initiated events in human skeletal muscle. Possible molecular differences in inter-individual response to exercise will also be discussed.

No conflict of interest

DEBATE

CLINICAL RESEARCH

Is anti-obesity drug treatment appropriate for treatment of obese patients with type 2 diabetes?

0111

For

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Obesity is considered to be a major health problem and its prevalence is rising worldwide. Obesity is linked to cardiovascular disease through several mechanisms, but the major consequence is the development of type 2 diabetes. In view of the firm link between obesity and type 2 diabetes and the knowledge that diabetic patients have even more difficulties to lose weight, anti obesity management is considered as a starting issue for treatment of patients with type 2 diabetes.
In addition to lifestyle intervention, pharmacotherapy appears to be effective; it gives rise to modest, but significant and meaningful weight loss.
Only a limited number of drugs can be considered as supportive treatment options for patients with type 2 diabetes: sibutramine, as a serotonin and noradrenalin reuptake inhibitor and orlistat, a gastric and pancreatic lipase inhibitor.
Sibutramine has a mainly central mechanism of action and promotes satiety resulting in weight loss; it also shows some moderate peripheral, mainly thermogenic effects. Despite some actions on blood pressure, individuals with type 2 diabetes may benefit with placebo-subtracted weight loss around 4-5 kg; it also shows improvement of A1c ranging from 0.5 to 0.8 % decrease over 1 year period of observation.
The weight results with orlistat are slightly less effective, showing however similar reductions in A1c; lipase inhibition has the extra benefit of a weight independent effect on LDL cholesterol, particularly of interest in patients at risk such as type 2 diabetes.
After the promising and challenging experience with the endocannabinoid receptor CB1 antagonist –rimonabant- a few medications used in the diabetes field may also offer weight loss properties such as exenatide, liraglutide and pramlintide.
The final conclusion on the outcome benefit of weight loss drugs in patients with diabetes can only be given with outcome trials: the SCOUT study (5 year outcome study, n=10.000 patients, 85 % of whom are diabetics) with sibutramine will be the first large trial to shed some light on this important clinical question.

Conflict of interest:
Paid lecturing: Abbott Pharma, Astra Zeneca, GSK, sanofi-aventis
Stock ownership: No
Advisory board: Abbott Pharma, Astra Zeneca, Eli Lilly& Co, GSK, NovoNordisk, sanofi-aventis,
Employee: No
Commercially-sponsored research: No
Other substantive relationships: No

0112

Against

J. Buse[1]
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How can one argue against anti-obesity treatment in obese patients? Theoretically, these agents have demonstrated adequate safety and efficacy for approval by regulatory authorities.
However, all the available agents are associated with adverse effects, some are only approved for short term use and some are somewhat burdensome to take. Furthermore, at least in many countries of the world, they are not covered by health care plans. In general, their efficacy in promoting weight loss is modest on average and their glucose lowering effectiveness is minimal. Therefore, the reason to avoid the use of these agents is that there is no compelling evidence regarding benefits beyond modest weight loss. And they add complexity, cost, risk and sometimes discomfort in patients who already usually have complex, costly, risky and sometimes discomforting treatment programs targeting diabetes, its complications and its other comorbidities.
Anti-obesity treatment is a distraction for most people with diabetes. Furthermore, the GLP-1 agonists and pramlintide provide the opportunity of antihyperglycemic regimens associated with similar weight loss. The evidence regarding the risks and benefits of anti-obesity agents can be summarized as hopeful and unproven; in an evidence-based, resource-constrained world, why would we even consider using anti-obesity drugs?

Conflict of interest:
Stock ownership: Insulet
Advisory board: Amylin, BD Research Labs, Eli Lilly, GI Dynamics, GlaxoSmithKline, J&J, LipoScience, MannKind, Novo Nordisk, Roche
Commercially-sponsored research: Amylin, Bayhill Therapeutics, Eli Lilly, Intekrine, Medtronic, Merck, Novartis, Novo Nordisk, Osiris, Pfizer, Roche, Transition Therapeutics

MEET-THE-EXPERT

Intensive glucose control in the critically ill

0113

Intensive glucose control in the critically ill

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A large body of evidence has associated hyperglycemia with adverse clinical outcomes in critically ill patients. The biological links between acutely elevated blood glucose (BG) levels and derangements in oxidative stress, vascular endothelial function, coagulation, immune function, and wound healing lend support to the theory that this relationship is 'cause-and-effect.' However, it remains highly controversial as to whether hyperglycemia is an actual mediator of increased morbidity and mortality or simply a marker of the sickest patients. Single-center studies in patients during acute myocardial infarction, following cardiothoracic operations, and in the surgical intensive care unit (ICU) have suggested a marked clinical benefit from the use of intensive insulin infusion to reduce BG concentrations. One study in the surgical ICU actually suggested that outcomes were optimized when euglycemia was achieved.
In follow-up studies from some of these groups, results were mixed and the benefits of intensive glucose control in the ICU could not be confirmed. Furthermore, when the question was subsequently addressed within the context of multi-center studies, outcomes proved to be equivalent between the intensive and conventional therapy groups. In each of these investigations, a significantly increased risk of severe hypoglycemia was observed in the more aggressively treated patients - the implications of which remain unclear. In a recent large, international study, a possible mortality risk from intensive glucose management in the ICU was even raised. While our professional organizations consider emerging data in this rapidly evolving field, it appears that achieving improved but not necessarily normalized BG levels is likely the most reasonable approach.

The evidence both for and against intensive glycemic control in the critical care setting will be reviewed. The importance of choosing a safe, effective and validated insulin infusion protocol will be underscored.

Conflict of interest:
Paid lecturing: Novo-Nordisk
Advisory board: Medtronic
Commercially-sponsored research: Eli Lilly Co.
Other substantive relationships: Participant in CME programs in which Sanofi-Aventis was a funding source.

MEET-THE-EXPERT

HIV therapy and diabetes risk

0114

HIV therapy and diabetes risk

S. Dagogo-Jack[1]
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Highly active antiretroviral therapy (HAART) has suppressed viral load, improved CD4 lymphocyte counts, decreased opportunistic infections, and reduced AIDS-related mortality. However HAART has been associated with adverse metabolic effects, including diabetes, insulin resistance, dyslipidemia, and lipodystrophy. The presentation of antiretroviral-associated diabetes is consistent with type 2 diabetes, and evidence of islet autoimmunity is rare in such patients. Early studies focused on HIV-1 protease inhibitors (PIs) as the most likely cause of the adverse metabolic effects–elegant studies have demonstrated the rapid development of insulin resistance and impairment of beta-cell function following exposure to PIs. The mechanism of insulin resistance involves molecular interference with glucose transport. The common peptido-mimetic core of HIV protease inhibitors bind to GLUT4. Risk factors for diabetes in patients with HIV infection treated with protease inhibitors include family history of diabetes, weight gain, lipodystrophy, older age, and coinfection with hepatitis C. Recent reports indicate that the nucleoside analogs (particularly stavudine) are associated with significant risk of incident diabetes during long-term treatment. Emerging data link nucleoside analogs to insulin resistance, lipodystrophy, and mitochondrial dysfunction, thus providing putative mechanisms for the development of diabetes. The management of diabetes in HIV patients follows the same general principles of dietary modification, physical activity, and selective use of medications. Agents that reduce insulin resistance appear to have a primary role. However, lactic acidosis and hepatic dysfunction associated with HAART regimen, and HIV nephropathy may limit choice of antidiabetic medications. Also, the A1c may be misleading in hemolytic states. Clearly, physicians need to be alert to the adverse metabolic effects of the expanding antiretroviral armamentarium. Furthermore, owing to the efficacy of HAART and improved nutritional status, many patients in remission gain significant weight, which increases their risk for insulin resistance, diabetes, and dyslipidemia.

No conflict of interest

MEET-THE-EXPERT

EDUCATION

Complementary medicines: is there a place in diabetes?

0115

Complementary medicines: is there a place in diabetes?

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Background: The global prevalence of traditional and complementary and alternative medicine (TCAM) use is increasing globally: range 40%-70%. Significantly, TCAM and conventional care are often integrated, which encompasses a different set of risks than using either type of medicine alone. The World Health Organisation Traditional Medicine Strategy 2002–2005 focuses on four main areas: policy and regulation, safety, efficacy and quality, access, and rational use. Many countries have developed guidelines, regulatory, and training process, and pharmacovigilance systems to enhance safety. Safety is a complex issue consisting of several inter-related factors concerning: practitioner-, consumer-, product-, and health system-related factors. However, practitioner and patient perspectives of risk differ.
Aim: To facilitate discussion about TCAM safety factors (practitioners, consumers, products, health system) that need to be considered when providing diabetes care to people using or contemplating using TCAM.
Method: A case study will be used to stimulate discussion about TCAM safety issues. Session attendees will be arbitrarily divided into five groups: four groups will each discuss one of the four safety areas. Group five will discuss the implications of TCAM use for people with diabetes and diabetes practitioners. Each group will record the main discussion points on a pre-prepared data sheet and then prioritise their top three safety issues, which will be presented to the main group.
Outcome: The session speaker will collect all the data sheets after each presentation and summarise the main safety issues and implications and note any significant issues that did not arise in the discussion.

No conflict of interest

MEET-THE-EXPERT

Developing innovative educational materials and programmes for parents and young people with type 1 diabetes

0116

Developing innovative educational materials and programmes for parents and young people with type 1 diabetes

K. Lange[1]
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With the onset of diabetes, families with an affected child face a new demanding task challenging them from now on for 365 days a year. To support all family members coping with the chronic disease, personalized age appropriate ongoing education has to be an integral part of paediatric diabetes care. Specific educational curricula, didactic concepts and materials adapted to each other for parents and children of different developmental stages will be presented. Especially a new modular demand-oriented education programme for adolescents and their parents will be introduced. It focuses on the comprehensive understanding of the intensified insulin therapy (MDI or CSII), practical skills for integrating diabetes into everyday life, helpful parent-adolescent cooperation and supporting a positive sense of self-efficacy. The initial talk explaining the diagnosis is the first important step of education with far reaching consequences for the families' lifelong coping with the disease. The setting, structure and content of this talk as well as the communication skills necessary to build a trustful relationship will be presented together with the printed information for young people at diabetes onset. Authentic stories and pictures of real-life young patients give first hand experiences about the life with diabetes and serve as role models for learning to cope with the disease. The educational materials consist of four "readers", two directed at "beginners", one aimed at "advanced learners" and the fourth at young people with CSII. In addition a collection of worksheets, problem-solving tasks, real life examples and interactive tasks dealing with subjects like exercise, travelling, illness, eating behaviour, weight control, body image, alcohol and other drugs, family planning and contraception, school, working life, legal issues, late complications and developing own future perspectives are provided for diabetes team members to offer lively educational – training – sessions for young people.

No conflict of interest

WORKSHOP

Initiate a behavioural change in three minutes – break the barriers!

0117

Initiate a behavioural change in three minutes – break the barriers!

J. Bédard[1]
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Behavioural changes (sedentary, diet, smoking, medication compliance..) are fundamental to the overall management of patients with high cardiovascular risks. Health professionals generally use a uniform approach for all patients: identifying problem behaviours, informing patients why and giving instructions on how to change (traditional directive approach).
Patients, however, don't change!
In response to this problem, we present a universal (identical for all professionals and all behaviours) intervention tool, focused on the patient and leading to recognition, reinforcement and the acceleration of the natural path to behavioural change.
Three concepts have been condensed into a coherent whole, creating a single practical tool to use for interventions that span only three minutes.
The first concept (Prochaska stages) orients the clinician toward the stage the patient is at in his journey. It therefore allows individual planning and defines the goal of each intervention: transition from one stage to the next one.
The second concept (Conviction-Confidence scale) defines the TARGET of the intervention.
Transition into Action that leads to change arrives only when Conviction (perception of advantages) and Confidence (perception of ability) are simultaneously very high.
The targeted intervention is intended to first increase Conviction, helping ready a patient (motivated) for change in the Preparation stage, then boost Confidence (identification of barriers and realistic strategies) leading into Action.
The third concept introduces the communication technique: Motivational Interviewing. Through the skilful use of open questions, it provokes, reinforces and accelerates progress along the path to change rather than directing it.
The open questions are intended to increase Conviction, first of all, by spurring the patient to express personal advantages with high emotional resonance (the three first Prochaska stages) and secondly by leading the patient to identify for himself the barriers and solutions (strategies) leading to the transition to action.
There are three levels on which this technique displays its advantages:

1. The use of such a communication technique, is the foundation of an intervention that is individualized, targeted and efficient in identifying the goal (Prochaska stages) and the specific target of each intervention (Conviction, Confidence).
2. The same tool provides an objective evaluation grid, during subsequent visits, to track success or setbacks in interventions when the patient advances or regresses in their progress, leading to subsequent readjustments of intervention strategies.
3. Finally, the use of this same tool (same language, techniques, etc.) by all members of the same therapeutic team (i.e. physicians, nurses, pharmacists, nutritionists, kinesiologists in a diabetes clinic..) creates a synergy that increases the acceleration of patient progress considerably as they move from one professional to the next.

The strength of intervention increases exponentially thanks to the fact that different professionals become links in the same chain – all pulling in the same direction!
Across the spectrum of medical interventions, we have spent more than 30 years focusing on the WHY of changing patient behaviours – the time has now come to promote the HOW!

No conflict of interest

DEBATE

ASSOCIATION DEVELOPMENT

The relationships between IDF and diabetes associations

0118

What can IDF do to help associations offer better care to their people

A. Ogbera[1]
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DM is associated with reduced quantity and quality of life and is unfortunately approaching epidemic proportions. The IDF has a role to play in checking the afore-stated ugly scenario and it can only do this by ensuring effective partnership with member associations. The IDF can help member associations in the following ways

1. Information and experiences sharing – Very little of this obtains right now, both between IDF and member Associations. IDF should regularly release information to member associations, and encourage member associations to share and exchange information on diabetes from their countries.
2. Capacity building -IDF should partner with institutions to train and develop the capacity of members who are involved in health care provision to people living with DM. For the health professionals, areas of focus should include research, treatment and management of diabetes.
3. Insulin provision: There should be an insulin provision programme for children with type 1 DM from developing countries.
4. Reaching out to countries in distress: Glucose lowering drugs, and glucose meters should be made readily available to member countries undergoing natural and man made disasters.
5. Research collaboration among member associations through the provision of research grants. IDF should initiate and sponsor inter-regional research programmes involving member associations from different countries on routine basis. This will assist in building a knowledge base on the issue of diabetes to inform more effective response programmes.
6. Annual/bi-annual competitions among member associations with modest awards to the best three performing associations. Such healthy competitions will enhance the activities of associations in their respective countries as well as bring the associations much closer to themselves and the IDF Secretariat.

Occasonal visits by the leadership of IDF: This would facilitate interaction, encouragement and assessment of the activities of associations, and provide ideas and advice where necessary for the growth of the associations.

No conflict of interest

0119

Do we have a tendency to blame IDF for our shortcomings: are the associations doing enough by themselves ?

S. Soegondo[1]
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The IDF as an international organization with precedence to health education, aiming guaranteed access to quality care, training, essential drug supply and support to people with diabetes, and take action to eliminate discrimination against them. Member countries join this only organization for people with diabetes with different hopes and aims. Presently, it is mostly known only by committee members/leaders of the associations/member countries. Its existence or direct impact is only felt by a certain group of people with diabetes of member associations. Some countries have active members but most countries have only members on paper. In many countries the IDF is not felt as an internationally strong organization in convincing their respective governments, compared to organizations on HIV- AIDS, Cardiovascular disease, Cancer etc. IDF officials visiting member countries should make courtesy calls to minister of health or even the head of the states if possible. The IDF succeeded initiating the "World Diabetes Day" / " United Nations Day for Diabetes." Success for publicity but,has no direct impact yet on associations and national policies. Associations in some countries are not strong enough, although they manage to organize activities on diabetes education and care in their

country, but often far from IDF expectations. They still needed support from their government, in implementing the IDF guidelines on diabetes education and management. The magnitude of diabetes as a global problem presented by leaders of an organization with an international network would be more convincing for governments. Many associations do not have the capability and the resources to run their organization and had difficulties to fulfill their duties for different reasons. Comments on IDF shortcomings and association's effort to solve them will be discussed further.

No conflict of interest

MEET-THE-EXPERT

Aspects in industry-association interactions

0120

Association-industry relations: how to make it a win-win situation !

B. Allgot[1]
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The background for interactions between the diabetes associations and the industry is based on some common goals within areas of information, awareness, attention, treatment and education in diabetes.
The diabetes associations often seek funding for their activities and projects. The relations to the diabetes related industry should be based on a broader platform. There are different methods used for interactions and different ways to interact: Awareness campaigns, sponsorship, Exhibitions on congresses, advertisements, mission distribution to different target groups, assisting in recruiting members etc. The platform for the interaction should be based on mutual respect, to protect all partners' integrity and credibility, to ensure transparency and to respect the cooperating partner's independence and different roles. One special challenge is the interaction between professionals and volunteers. On a lot of areas the industry has different, but not contradictive goals than the association, for example internal economic goals and goals for the market for their products. The association should always have focus on enhancing the lives of people – to put the interest of people with diabetes first. It is easier for the associations to cooperate on increasing the market than to interact on sharing the market.
The way to a successful interaction is to understand and increase the awareness of the different roles and to reach agreements of common goals for the interactions. By developing ethical and practical guidelines and by acting with integrity, all partners can experience the fruitful cooperation and the power from working together with the industry.

No conflict of interest

0121

How to enhance the trust in the association-industry relationship

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All major stakeholders, health care professionals and their organizations, have a genuine interest in the quality of diabetes care. But also editors of diabetes journals, scientists, health care payers, and the pharmaceutical & device companies are major stakeholders and share this interest. Why is the public perception of the drug industry, doctors and scientists at an historic low? This is a complex question with no easy answers. The perception is that drug companies, and other for profit organizations, are only accountable to their shareholders, which creates an apparent conflict of interest. It is 'apparent', as these interests, also from a business perspective, should be the same. Unfortunately it is in the human nature to be distracted by financial incentives, scientific fame, career opportunities, and other benefits. How can we prevent misconduct? Recently it was recommended that professional medical associations (PMA) should end all relationships with industry to enhance the public's trust. Others rely on full disclosure of existing relationships. Neither offers a real solution. The first proposal eliminates the considerable brain power in industry and their resources; the latter provides meaningless and often misleading information. The solution needs to be found in professionalizing the relationship. An important distinction needs to be made between scientific relationships (research and development) and commercial ties (promotional activities). PMA's, scientists and physicians can contribute considerably in working together with the R&D activities of the drug industry. This professional collaboration can contribute considerably to health care and patient outcome. However, drug companies have to refrain from commercial studies in the guise of science (seeding trials) or promotional meetings in the guise of education. In addition, the PMA's need to teach their membership to identify and to report this kind of misconduct. This mutual responsibility and accountability will enhance the trust and promote the quality of care.

Conflict of interest:
Stock ownership: Eli Lilly and Company
Employee: Eli Lilly and Company

OPEN FORUM

LIVING WITH DIABETES

Diabetes Youth Empowerment Programme: its value and place in the future of IDF

0122

DYEP: its value and place in the future of IDF

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Though dwarfed by millions of people with type 2 diabetes, there is approaching one million young adults between the ages of 18 and 30 with type 1 diabetes. Traditionally, Members Associations - and IDF - have found it difficult to engage with this group. Young people with diabetes often feel marginalised as a result. At the Global Congress in Cape Town, there was an imaginative Youth Ambassador programme whose potential was never fully realised. DYEP, Diabetes Youth Empowerment Programme, would seek to build on that programme, but in some vitally different respects. Much thought has been given to the DYEP concept in the current triennium, with a view to mainstreaming and developing it in the next.
DYEP would be a Member Association led programme. MAs and those interested in diabetes in that country, would identify suitably motivated young people between the ages of 18 and 30. Working with the MA, the young person would plan a project which was suitable to local circumstances - in advocacy, peer support, or community and youth outreach.
The DYEP candidates would then come together at the biennial Global Congress at which they would share experiences and, with appropriate mentoring, would refine their projects with a view to implementing them over the next two years. The buy-in and encouragement of the MA is considered critical to the success of DYEP.
These young people would represent a powerful cadre of champions for type 1 diabetes. They would thrive on the shared experence of coming together with a joint purpose. All would learn from one another and from their mentors.
A stream of talented, trained, committed future leaders would result for MAs and for IDF. The programme would ideally be self-sustaining, with past DYEP 'graduates' coming forward to help lead the programme in future years.

No conflict of interest

SPEAKERS' CORNER

Diabetes online

0123

Diabetes online

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People living with diabetes are using the internet in new and changing ways to learn about their condition, connect with others, document their experiences and build communities. But is it safe and reliable? Should it be recommended and endorsed? Are online services the efficient and economical future for diabetes education and support?

This session will provide a case study of RealityCheck.org.au, a website founded by people with Type 1 Diabetes in Australia more than 10 years ago. The website is now an active online community and has given rise to a national consumer organisation with 4,000 members, The Type 1 Diabetes Network. With the Reality Check online community remaining at the core, many other services and activities have developed, both online and in other forms. The organisation has published educational materials, created advocacy and awareness campaigns and undertaken original research with marginalised groups.
The case study will explore strategies that have been used by Reality Check over many years to manage the real and perceived risks of online discussions about medical conditions whilst maintaining a lively online community that people with Type 1 Diabetes of all ages actively visit, and which has grown into a multi-faceted consumer organisation.

No conflict of interest

SYMPOSIUM

CLINICAL RESEARCH

PPAR-agonists 10 years on

0124

Physiologic lessons

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Because of their wide range of actions on glucose homeostasis, lipid metabolism and vascular inflammation, peroxisome proliferator-activated receptors (PPARs) have been identified as ideal targets for the development of drugs for the treatment of diabetes and its vascular complications. In clinical practice, PPARa agonists, such as the fibrates, improve dyslipidemia, while PPARg agonists, such as thiazolidinediones, improve insulin resistance and diabetes. PPARb/d agonists may improve whole body energy homeostasis and thus prove to be useful for the treatment of obesity and diabetes. The complementary action of simultaneous activation of each PPAR in patients suffering from metabolic syndrome and type 2 diabetes has led to the proposal of pharmacological strategies focused on the development of agonists targeting more than one receptor such as the dual PPARa/g agonists. However, despite the benefits of targeting PPARs, safety concerns have recently led to late stage development failures of various PPAR agonists including novel specific PPARg agonists and dual PPARa/g agonists. These safety concerns include potential carcinogenicity in rodents, signs of myopathy and rhabdomyolysis, increase in plasma creatinine and homocysteine, weight gain, fluid retention, peripheral edema and potential increased risk of cardiac failure. Although the discontinued compounds shared common side effects, the reason for discontinuation was always compound specific and the toxicological or adverse effects which have motivated the discontinuation could be either due to the activation of PPARg, PPARa or both (class effect) or due to a PPAR unrelated effect. Thus, when developing novel compounds, the risk evaluation of each adverse effect should be viewed on a case by case basis considering both the PPAR profile of the drug, its absorption/distribution profile, the nature of the side effect and the putative PPAR-related mechanism of action. The selective modulation of PPAR activities is a promising approach to develop new drugs with preserved efficacy but diminished adverse effects.

No conflict of interest

0125

Results of the RECORD[1] Trial

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[1]Rosiglitazone Evaluated for Cardiac Outcomes and Regulation of Glycaemia in Diabetes (RECORD)
Background: Rosiglitazone is an insulin sensitizer used for glucose-lowering in combination with metformin and/or sulfonylurea in people with Type 2 diabetes. Our aim was to assess cardiovascular outcomes in combination with either metformin or sulfonylurea, compared with the combination of the two, over 5-7 years. Additionally we assessed comparative safety.
Methods: In a multicentre, open-label study, we randomized 4447 people with Type 2 diabetes on metformin or sulfonylurea monotherapy with mean HbA1c 7.9 % to add-on rosiglitazone (n=2220), or to a combination of metformin and sulfonylurea (active control group, n=2227). The primary endpoint was cardiovascular hospitalization or cardiovascular death, with a hazard ratio (HR) non-inferiority margin of 1.20.
Findings: In the rosiglitazone and active control groups 321 and 323 people respectively experienced the primary endpoint during a mean 5.5 years follow-up, which met the criterion of non-inferiority (HR 0.99: CI 0.85, 1.16). Hazard ratios for key components of the primary endpoint included CV death 0.84 (0.59, 1.18), myocardial infarction 1.14 (0.80, 1.63), and stroke 0.72 (0.49, 1.06). Heart failure hospitalizations or deaths occurred in 61 and 29 people in the rosiglitazone and active control groups respectively, HR 2.10 (1.35, 3.27), risk difference 2.6 (0.11, 0.41) per 1000 pt-yr. The rosiglitazone group had increased upper and distal lower limb fracture rates, predominantly in women. Mean HbA_{1c} was lower in the rosiglitazone group at 5 years.
Interpretation: Rosiglitazone is confirmed to increase risk of heart failure, and also risk of some fractures (mainly in women). While the data remain inconclusive regarding any possible effect on myocardial infarction, rosiglitazone compared to standard glucose-lowering drugs shows no evidence of increased risk of overall CV morbidity or of mortality.

Conflict of interest:
Paid lecturing: GlaxoSmithKline
Stock ownership: None
Advisory board: GlaxoSmithKline, Roche and AstraZeneca
Employee: None
Commercially-sponsored research: GlaxoSmithKline and Novo Nordisk
Other substantive relationships: None

0126

Long term trials and cardiovascular disease

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Thiazolidinediones (TZDs) are effective glucose-lowering agents, and major long-term trials have confirmed the efficacy of both rosiglitazone and pioglitazone in diabetes prevention (DREAM, ACT NOW), and demonstrated the durability of glycemic control associated with rosiglitazone (ADOPT). In addition to directly decreasing insulin resistance, TZDs have favorable effects on a number of cardiac risk factors and markers including some aspects of the lipid profile, coagulation and fibrinolysis, endothelial function, inflammation and fat distribution. This combination of glucose-lowering and possible vasculoprotective effects suggested a promise of cardiovascular risk reduction associated with this class of drugs. Several studies showing benefits on surrogate markers for atherosclerosis (e.g. carotid IMT) reinforced this promise. Although pioglitazone therapy in the PROactive study did not significantly reduce the broad primary cardiovascular composite endpoint, the so-called "principal secondary endpoint" was reduced significantly. A controversial meta-analysis by Nissen and Wolski brought into question the cardiovascular safety of rosiglitazone. This analysis reported a cardiovascular signal of increased ischemic events, derived primarily from 6- to 12-month studies that were not designed to properly capture and adjudicate cardiovascular events. Longer-term cardiovascular studies and meta-analyses, however, have generally not confirmed this finding, although the risk of congestive heart failure has been increased in most studies. On the other hand, despite the initial promise, there is little outcome data demonstrating a CV benefit of TZD use. This has led some to question the role of insulin resistance in promoting atherosclerosis and/or whether the drug(s) may in fact have adverse cardiovascular effects. Alternatively, the lack of demonstrated benefit may simply be a function of the duration of these trials (i.e. a general lack of CV reduction observed in 3- to 5-year glucose-lowering trials).

Conflict of interest:
Paid lecturing: Astra Zeneca, GSK, Merck, Merck Schering Plough, Novartis
Stock ownership: No
Advisory board: Astra Zeneca, BI, Eli Lilly, GSK, Merck, Merck Schering Plough, Novartis, Novo Nordisk, sanofi-aventis, Servier
Employee: No
Commercially-sponsored research: Astra Zeneca, Eli Lilly, GSK, Merck, Merck Schering Plough, Novartis, Novo Nordisk, sanofi-aventis
Other substantive relationships: No

0127

TZDs and bones

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TZDs are now widely used in the management of diabetes, and of some pre-diabetic conditions. They act via the PPARγ nuclear transcription factor, which is expressed in a number of tissues. In stromal cells, activation of PPARγ promotes differentiation along the adipocyte lineage in preference to that of osteoblasts. In addition, by reducing insulin resistance, TZDs are likely to reduce circulating levels of bone anabolic factors, such as insulin, amylin and preptin. Some pre-clinical data suggest that activation of PPARγ stimulates osteoclastogenesis. As a result of these actions, we hypothesized that TZDs might have adverse effects on bone in humans, and conducted a 3-month, randomized, controlled trial in normal postmenopausal women to assess this possibility. Indices of bone formation were decreased by 10-15% within the first month of intervention, without comparable decreases in bone resorption. Associated with this, was a 2% decrease in total hip BMD and a 1.5% decrease in lumbar spine BMD during this short-term study. These data suggested that the detrimental bone effects of these drugs in rodents apply to humans also, and led to an examination of fracture frequency in subjects using TZDs. Adverse events data from controlled clinical trials indicate that TZDs are associated with an increased frequency of limb fractures in women, and observational data suggest an increase in risk of "classical" osteoporotic fractures in both sexes..The rapidity of bone loss and the extent of the increase in fracture incidence suggest that fracture risk assessment should be undertaken in most individuals using TZDs. In most cases this will involve bone density measurement. New agents in this class need to be assessed for their skeletal effects and trials are needed of interventions that may potentially mitigate these adverse changes.

No conflict of interest

SYMPOSIUM

EDUCATION

Diabetes in the young

0128

Insulin therapy in the very young

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The incidence of type 1 diabetes has been increasing rapidly in the last decades, particularly in children younger than 5 years, where a doubling of new cases is predicted between 2005 and 2020 (Patterson et al. Lancet 2009). Optimal treatment aiming not only the achievement of the best possible glycemic control from the beginning of the disease without inducing severe hypoglycaemia, but also normal somatic and psychosocial development of the very young patients is crucial and of great importance.
In the last decade, a paradigm shift has occurred concerning the insulin therapy in pediatric diabetes. While previously it was thought that the best way to overcome barriers of treating children would be to spare them from an insulin regimen consisting of many daily injections, nowadays the majority of pediatric diabetologists feel that the gold standard treatment is intensified insulin therapy. This therapy is based on the basal-bolus principle and aims to mimic the physiological insulin profile seen in non-diabetic individuals as closely as possible. This kind of regimen is believed to allow the flexibility required with the lifestyle needs of young children with diabetes and help their families to better cope with the demands of the therapy. To match these challenges for individually tailored therapy, the choice of short-, intermediate-, long-acting insulins, and insulin analogues, as well as of devices like insulin pumps and glucose sensors have been established as treatment options for young children with diabetes.
Moreover, initial age-appropriate diabetes education as well as subsequent ongoing education during the long-term course of the disease represents an integral part of each therapeutic regimen. Diabetes education is the basis for a self-determined implementation of adequate therapeutic measures by parents and children. Furthermore, support from school and day-care is also important in the very young patients, because good diabetes management has to be maintained even when the children are away from home.

No conflict of interest

0129

Exercise and the adolescent

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For adolescents with type 1 diabetes, regular physical activity should be a cornerstone of care as it enhances cardiovascular fitness, increases lean mass, improves blood lipid profile, supports psychosocial well-being and health and reduces diabetes-related complications. Compared with sedentary behaviour, being physically active enhances insulin sensitivity and is associated with better haemoglobin A1c (HbA1c) levels in epidemiological studies of youth with type 1 diabetes. Surprisingly, however, clinical trials in which youth with type 1 diabetes undergo aerobic training often fail to demonstrate improvements in HbA1c with regular exercise. This paradox may be explained by the fact that exercise causes increased incidence of hypoglycemia and poor strategies are in place to help youth with diabetes prepare for exercise and competition. Exercise also can cause hyperglycemia, particularly when the event is very vigorous in nature or when there is a high level of competitive stress. This lecture highlights the physiological regulation of blood glucose levels in adolescents with type 1 diabetes during and after sport, and provides recommendations on insulin and carbohydrate intake regimens to help prevent exercise-associated dysglycemia.

Conflict of interest:
Commercially-sponsored research: Medtronic, Canada

0130

Diabetes complications: educating adolescents

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Adolescents appear to consider health the absence of disease rather than the maintenance of wellbeing. Thus educating adolescents with diabetes on future potential problems is challenging.
Since 1989, the Children's Hospital at Westmead has run a dedicated Diabetes Complications Assessment Service (DCAS). Screening for microvascular changes for our adolescents begins 2 years after diagnosis and closely follows ISPAD guidelines. We believe that screening is an essential component in the education of our adolescents. We assess for retinopathy, nephropathy and neuropathy and educate throughout the screening process.
We recently invited a group of young adults to return to our clinic for a follow up study. 101 completed a current health care questionnaire. We included basic questions on the frequency of screening for retinopathy and microalbuminuria. 55% knew the recommended frequency of screening for retinal changes, 18% stated they did not know. 43% knew how often kidney function should be reviewed, 29% stated they did not know. 39% correctly answered the screening frequency for both. Only 6 people stated they did not know if they had diabetes related eye problems but 34 reported they didn't know if they had problems with kidney function. 66% could give a value for their last HbA1c. They were asked how often their HbA1c's should be assessed and 39 answers were correct. Just 18 young adults were correct in their answers regarding the recommended frequency of HbA1c, retinal and renal assessment. 81 people reported they see an adult endocrinologist for diabetes care with the frequency of visits ranging from 3 monthly to 2nd yearly.
This snap shot reinforces our experience that adolescents are more concerned about diabetes affecting their vision. To us they appear most attentive during retinal screening. The message we deliver to adolescents needs to be brief, simple, relevant and positive.

No conflict of interest

0131

Managing children with diabetes in Bolivia, an underserved country

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Summary: Bolivia is a developing country with a weak health system. Diabetics do not have assistance, except that provided by the so-called "health insurance".
No child with diabetes in Bolivia has equipment and supplies for self-control and they do not have the economic capacity to acquire them.
The IDF's LIFE FOR A CHILD developed in Bolivia through the work with the Center VIVIR CON DIABETES, has filled an important gap in the care of children with diabetes in Bolivia.
Objectives: Provide children with diabetes in Bolivia, especially the poor, the opportunity to have access to insulin, meters and test strips.
Conduct an educational program, offering this program to parents and families of children with diabetes with distinct content.
Evaluate effectiveness of an educational program when combined with the supply of insulin, glycemic control and the involvement of the family.
Sample:
Group 1: children with diabetes living in Cochabamba, Headquarters of the Center Vivir con Diabetes.
Group 2: children with diabetes receiving insulin and strips but live in other regions of the country where the educational program is not being developed.
Methods:
- Registration of persons, treatment, weight, height, glycated hemoglobin, lipid profile, renal function tests and checks at 6 and 12 months
- Modular implementation of education programs, participatory constructivist method
- Program evaluation and laboratory control.

Expected results: That children with diabetes in Bolivia have the same opportunities for children and young people from other countries.
That children and young people with diabetes and their families in Bolivia have access to diabetes education, through a multidisciplinary team.
That children and young people with diabetes through an optimal treatment and control have an excellent quality of life and do not present complications in the future.

No conflict of interest

SYMPOSIUM

CLINICAL RESEARCH

Genetics of type 2 diabetes - relevance to clinical practice

0132

Understanding the genetic approach to obesity and type 2 diabetes

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Over the past few decades several approaches have been used to unravel the genetics of type 2 diabetes (T2DM). The first was to focus on forms of type 2 diabetes transmitted with a Mendelian dominant pattern of inheritance and this led to the discovery of genes involved in Maturity Onset Diabetes of the Young (MODY). The second approach looked for variants in candidate genes associated with T2DM. This led to the identification of genes such as PPARg, ***KCNJ11*** and ***ENPP1*** genes to be associated with T2DM. The most powerful approach is the recent high-throughput genome wide analysis studies (GWAS) which have identified several novel genes associated with T2DM and obesity including the TCF7L2 gene.
Large population based (Chennai Urban Rural Epidemiology Study) genetic studies carried out by us have shown some unique genetic findings among Asian Indians who have increased susceptibility to T2DM. The Pro12Ala polymorphism of the PPARg gene, which is known to be protective against diabetes in Europeans, does not offer protection to Indians. We also observed that the Thr394Thr (G®A) polymorphism of PPARGC-1 α gene was strongly associated with T2DM as well as body fat in Indians. Further, the Gly1057Asp polymorphism of IRS-2 gene predisposes Indians to diabetes particularly in the presence of obesity. Subjects with TCF7L2 gene G>T polymorphism at rs12255372 showed a 1.5 fold higher risk of having diabetes confirming similar association in other populations. Some genes like the FTO gene are associated both in obesity and T2DM.

No conflict of interest

0133

Implications of genetics to clinical medicine

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Over the past few years there has been an impressive improvement in the ability to identify new genetic risk factors that contribute to the development of type 2 diabetes (T2DM). This advance is largely attributable to surveys of genome-wide association in large samples of the population. Approximately 20 common genetic variants have been recognized to be implicated in the susceptibility to T2DM and almost all of them are related to impairment of insulin secretion. Expectation has been generated that some of these genetic variants may allow better identification of subjects requiring specific prevention measures. This possibility has been tested by assessing the discriminative power of genetic as compared to clinical risk factors to show that common genetic variants associated with risk of diabetes have small effect on the ability to predict the disease. Addition of specific genetic information to the clinical factors, however, slightly improved prediction suggesting that more accurate information on gene – environment interaction should be gathered. An example of such interaction has been highlighted with respect to CV risk. A substantial portion of the T2DM subjects may carry a common allele on chromosome 9p21 associated with risk of coronary artery disease (CAD) in the general population. In diabetic individuals a strong interaction between genotype and glycemic control has been reported. Identification of risk allele carriers may allow better risk stratification although generalization of these observations require confirmation. Genetic factors may also affect response to glucose-lowering medications. For instance, a greater reduction in fasting plasma glucose and HbA1c can be seen in carriers of Pro12Ala PPARγ polymorphism treated with thiazolidinediones. Nonetheless, the pharmacogenetic associations reported so far still have limited impact on the choice of individual treatments. In conclusion, the possibility of translating genotyping into clinical medicine is not yet available and further advances in our capacity to understand disease mechanisms, to gain better interpretation of the impact of genetic variants on risk and drug response, and to effect clinical translation is required.

No conflict of interest

0134

Genetics of type 2 diabetes

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While the genetic causes of monogenic disorders have been successfully identified in the past, the success in dissecting the genetics of complex polygenic diseases has until now been limited. The picture has dramatically changed during the last years with the introduction of whole genome wide association studies (WGAS). In 2007 five WGAS have been published on genetics of type 2 diabetes (T2D) and 10 genes were shown to be consistently associated with T2D (TCF7L2, PPARG, KCJN11, CDKAL1, IGFBP2,CDKN2A/CDKN2B,HHEX, SCL30A8, FTO and WSF1). A recent meta-analysis added 6 more variants to this list and replication efforts of glucose-related traits have shown that variants in G6PC, GCK, GCKR and the melatoninreceptor MTNR1B are associated with glucose and insulin levels. Common to most of these variants is that they seem to result in impaired beta-cell function. Individuals who carry these variants seem to be unable to increase their insulin secretion in response to an increase in BMI and insulin resistance to maintain glucose tolerance normal. It is premature to start to use these genetic variants for prediction of T2D as we have only been able to explain a small proportion of the familial risk of T2D. We shall though not underestimate the importance of dissecting novel biological pathways for the pathogenesis of T2D, some of which might become potential new drug targets. An important step will also be to use the genetic information for prediction of disease progression, development of complications and response to treatment, i.e. a step towards individualized medicine.

Since genetic research has been driven by technical progress, we can anticipate that the possibility to sequence the whole genome within the next years will allow a much more comprehensive genetic map of T2D.
For the first time we can with some confidence anticipate that the genetics of a complex disease like T2D really can be dissected.

No conflict of interest

0135

Genetics of obesity and height

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Twin and family studies have consistently reported that more than 70% of the human individual variation in adiposity is apparently due to genetic factors. Human height (stature) is even a stronger genetic trait, with up to 90% of the variation in height within a population determined by a combination of multiple inherited factors. Genome Wide Association Studies (GWAS) conducted in dozen of thousands individuals have consistently identified common genetic variations that are associated with stature or with Body Mass Index. So far, up to 300 genetic loci have been reproducibly shown to have an influence on adult height. About 50 loci modulate BMI and increase risk for obesity. Many of these loci also harbor rare mutations responsible for more severe alterations in height/skeletal growth or associated with severe obesity. In this regard, same genes/pathways contribute to both "normal" and pathological phenotypes associated with body corpulence or stature.
The main lesson from genetics studies in obesity is the key causal role of genes involved in appetite/food intake behavior expressed in the CNS. In this regard, the leptin-melanocortin pathway has a central role in human appetite regulation. The newly discovered obesity gene FTO is also likely to modulate food intake. More diverse pathways not well elucidated are involved in stature. Although the predictive value of the common variants thus far discovered remains low, the identification of these loci has led to new insights into the biology of human growth and adiposity, and should help identify genes that underlie previously uncharacterized severe conditions linked to obesity or abnormal skeletal growth, opening new avenues for better treatments.

No conflict of interest

SYMPOSIUM

HEALTHCARE AND EPIDEMIOLOGY

Diabetes and hyperglycaemia: the size of the problem

0136

Cost and projection of the problem

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Diabetes is a worldwide concern. Globally, the prevalence of diabetes has increased fivefold in the past 30 years, with some considering it an epidemic, driven largely by increasing prevalence of diabetes risk factors, such as aging of the population and obesity. According to World Health Organization (WHO), 171 million people worldwide had diabetes in 2000 and this number will reach 366 million by the year 2030. The clear majority (near 95%) of cases are type 2 diabetes. Despite improved survival overall, mortality rates for people with diabetes remain twice as high compared to those without diabetes, contributing to a 20% reduction in life expectancy, about 11 years of life lost, on average. The accumulation of comorbidities and complications in people with diabetes is also associated with tremendous costs to our health care systems and reductions in functional status and quality of life for individuals living with this disease. Estimates of health care costs have suggested that people with diabetes have 2 to 3 times the health care costs of people without diabetes. Annual health care costs for people with diabetes increase with time following initial diagnosis, and are driven largely by the cost of care for cardiovascular comorbidities. Epidemiologic and economic forecasting models have been developed to predict the future burden and serve as basis for economic evaluations of new treatment strategies.

No conflict of interest

0137

Changing population shift

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In most populations, the variation of blood glucose forms a continuous unimodal distribution skewed towards the higher values corresponding to people with impaired glucose regulation. The latter are considered at high-risk for developing diabetes and their frequency is increasing (as much or even more than people who already have diabetes and are at the far end of the distribution). What has not been fully recognized is that the glucose distribution of the normal glucose tolerance (NGT) majority also has been shifting to the right, indicating that the whole population is involved. We compared a rural and an urban population where the latter had a prevalence of IGT and diabetes almost double, and the mean blood glucose of the population with NGT was also significantly higher while the coefficient of variation remained roughly constant. Other variables related to diabetes such as weight, blood pressure and triglycerides had a similar trend.
Although the high-risk group has been the target for successful preventive interventions, there is a rationale for changing the population shift by generalizing these interventions, particularly those involving lifestyle changes. It has been hypothesized that moderate and achievable change by the population as a whole might greatly reduce the number of diseased people.
There have been good examples of collective interventions in different parts of the world, but unfortunately they are seldom evaluated at the population level and proving their effectiveness is problematic. They are usually complex and multifaceted, require ingenuity and involve many actors. They may be difficult to implement in other settings due to different priorities, resources, policies and cultural barriers. Nevertheless, they may be the only way to change the population shift in such risk factors as weight and other components of the metabolic syndrome which are driving the diabetes epidemic.

No conflict of interest

0138

Population - glucose curves

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The notion that the basis for T2 diabetes (T2DM) world-wide can be characterised from distributions of glycaemia is out-of-date, now intellectually bereft & possibly dangerous to patients. Evidence that blood glucose, whether 'fasting' or after GTT, is a genuinely independent risk factor for what matters long-term in T2DM, namely cardiovascular, retinal & renal vascular damage / events, is inconsistent and inconclusive. BMI & fat distribution are the major issues, from low starting ranges (eg: $<23 kg/m^2$ in 2 large European-origin, lower in South Asian, populations). Major treatment trials recently published all show that current treatment directed just at glycaemia, tightly or even moderately controlled, have no impact on mortality and may cause death earlier than does standard care, with no impact on stroke, all vascular events nor, contrary to a recent meta-analysis dubiously omitting $\geq$2 important trials to include 1 secondary prevention, useful effect on coronary events. Weight gain in all was substantial - the opposite of physiologically appropriate treatment like metformin. Much-quoted UKPDS, a relatively small but highly complex, multiply sub-randomised trial, showed only very slight impact on eye disease, with effect limited to progression, not prevention, and dubiously significant if events in the intensive blood pressure treatment arm are excluded. These issues have been difficult to debate because they are unpopular, reminiscent of UGDP trial controversies in the 1970s.
In different global populations, blood vessel damage, notably in small resistance vessels & 'stiffening' of larger arteries, is already present ***prior to*** elevation of glycaemia. These and other new data suggest that 'hyper'glycaemia may only be a late development in what precedes such T2DM pathology. While controversial, such data and poor response to expensive, intensive therapy suggest IDF needs to grasp 'non-glycaemic' definitions of T2DM to develop the world's 'diabetes' needs appropriately.

No conflict of interest

0139

Scale of the problem globally

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Recent decades have seen a major rise in the number of people with diabetes worldwide, even after accounting for changes in diagnostic criteria and in screening policies. Several factors have been responsible for these changes. Firstly, behavioral and environmental changes mean that the prevalence and risk of type 2 diabetes have risen rapidly. This is best illustrated in countries such as India, in which the prevalence of diabetes in big cities is six times that seen in rural communities. As urbanization rapidly progresses in developing countries, the proportion of the population adopting behaviors that increase their risk of diabetes will continue to grow. Secondly, even if the age-specific risk for diabetes had remained unchanged, we would still have seen the number of people with diabetes rising, simply as a consequence of increases in population size and, in particular, in the numbers of older adults. Thirdly, better care for people with diabetes has improved survival, and so even if the numbers of people developing diabetes remained static, the proportion of the population with diabetes at any one time would have risen.
Although type 2 diabetes has often been seen as a 'Western' disease, and the health problems of developing countries have centred on communicable diseases, the overwhelming majority of people with diabetes now reside in the developing world, and diabetes, along with cardiovascular disease and other non-communicable diseases are beginning to dominate the health problems of the developing world.
Whilst much attention has focused on the rising numbers of people with type 2 diabetes as a result of changes in diet and in physical activity, leading to obesity, there has been an even greater rise in the numbers of children developing type 1 diabetes. This phenomenon has now been described in a number of countries, but has not yet been explained.

No conflict of interest

SYMPOSIUM

FOUNDATION SCIENCE

Genetic regulation of islet ß-cell function and survival

0140

Novel approaches to understand epigenetic regulation of islet ß-cells

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Aims: The chronic metabolic insults experienced by the pancreatic islet in type 2 diabetes are likely to not only affect the acute gene regulation of beta-cells, but also be reflected in their epigenetic program. We hypothesized that analysis of epigenetic marks of islets from normal or diabetic organ donors can reveal new targets for intervention to improve health and function of beta-cells.
Methods: We employed ChIP-Seq, or the ultra-high throughput sequencing of millions of DNA fragments occupied by a given histone modification to analyze the methylation status of human islets. We focused on the activating marks, histone H3K4me3 and H3K4me1, and the repressive mark, H3K27me3. We also determined the complete microRNA profile of normal and diabetic islets by direct sequencing, and the mRNA profile by microarray analysis.
Results and conclusions: Activating and repressing chromatin marks were remarkably consistent between islets preparations. The same was true for the microRNA profile. Comparison of the chromatin marks between normal and type 2 diabetic islets suggests several pathways that are impaired in the diabetic islet.

No conflict of interest

0141

Using epistasis to dissect regulatory networks in islet ß-cells

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Understanding the epigenetic make up of pancreatic insulin producing beta-cells is relevant for efforts to reprogram beta-cells for the treatment of diabetes, to understand how transient environmental cues could lead to long-lasting changes in beta-cells, and to unravel the effects of genetic variation on beta-cell gene regulation. Our current knowledge of the beta-cell epigenome, however, is extremely limited.
We have now used tiling arrays to create a signature of histone modifications in purified mouse pancreatic beta-cells. We determined the unique properties of this signature by comparison to a panel of mouse tissues. We also examined how these modifications are placed during development by examining pluripotent cells, multipotent pancreatic progenitors, and differentiated pancreatic cells. The results revealed that the beta-cell exhibits a program of genes that undergoes selective repression by trimethylated Lysine 27 histone H3. This program is formed by the de novo acquisition of histone modifications during embryonic development, and is consequently shared in part with other cells of common ontogeny. Another major epigenetic program of beta-cells is composed of genes that are selectively derepressed in beta-cells and neural tissues, and thus exhibit lack of trimethylated Lysine 27 histone H3 specifically in these cell types. This program is activated during late stages of beta-cell differentiation concomitantly with the repression of the transcriptional repressor Rest. These results thus identify two major programs that define the epigenetic phenotype of the pancreatic beta-cell.
We have also combined next-generation sequencing technologies with formaldehyde assisted isolation of regulatory elements (FAIRE) to map open chromatin sites in human pancreatic islets. These studies revealed the existence of broad islet-specific regulatory domains linked to known and putative developmental regulator genes. They also provided an opportunity to assess the impact of human sequence variants on chromatin structure in human pancreatic islets, and point to potential epigenetic mechanisms underlying the susceptibility to Type 2 diabetes.

No conflict of interest

0142

Gene networks regulating islet ß-cell apoptosis

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Pancreatic beta cells die by apoptosis in early type 1 diabetes mellitus (T1DM). Recent observations by our group suggest that beta cell apoptosis depends on the parallel and/or sequential up- and down-regulation of hundreds of genes. By performing microarray analysis and detailed promoter studies in primary rat beta cells and in human islets exposed for different time points to the cytokines interleukin-1b (IL-1b), tumor necrosis factor-a (TNF-a) and interferon-g (IFN-g) and to diabetogenic viruses, we observed that beta cells respond to damage by triggering several genes involved in defense/repair and endoplasmic reticulum stress, by decreasing their most differentiated functions and their capacity for growth and regeneration, and by inducing expression of diverse cytokines and chemokines. Several of these effects of cytokines are regulated by the transcription factors NF-kB and STAT-1, and by blocking NF-kB or STAT-1 we prevented both cytokine and dsRNA + cytokine-induced beta cell death. Subsequent experiments, combining NF-kB or STAT-1 blocking and microarray analysis, suggested that both transcription factors function as "master switches" of respectively IL-1b and IFN-g effects on beta cells, controlling networks of transcription factors and effector genes that trigger apoptosis and inflammation. Other transcription factors, such as JunB, may function as "protective regulators", decreasing expression of pro-apoptotic genes and modulating endoplasmic reticulum stress. By combining functional studies with microarray and proteomic analysis, performed with or without targeted perturbations of the system, it will be eventually possible to fully map the interacting networks of genes and proteins leading to beta-cell death and amplification of the immune assault. This should allow the search for a cure for T1D to move from an empiric and blind approach to one that is really mechanistically driven.

Supporting references:
Eizirik DL, Moore F, Flamez D, Ortis F Biochem Soc Transact 36: 321-327, 2008.
Eizirik DL, Colli M, Ortis F Nature Rev Endocrinol, 5: 219-226, 2009

No conflict of interest

0143

The role of miRNAs in islet ß-cell function

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MicroRNAs (miRNAs) are an abundant class of short non-coding RNAs that have been identified in the genomes of a wide range of organisms. They bind through imperfect base pairing with specific sequences in target mRNAs. This induces either degradation of the target mRNA or translational repression. This mechanism resembles the process of RNA interference triggered by double-stranded RNA and utilizes a similar molecular machinery. To date, dysregulated expression of miRNAs has been implicated in several disease areas. In this lecture the biological function of several miRNAs in the regulation of glucose and lipid metabolism will be discussed. In addition, novel approaches will be illustrated that allow the inhibition of specific miRNA in vivo and might be exploited to effectively regulate therapeutically relevant disease processes.

Conflict of interest: Advisory board: Alnylam Pharmaceuticals, Regulus Therapeutics

SYMPOSIUM

LIVING WITH DIABETES

Adequate nutrition: prenatal and postnatal – vital

0144

Prenatal nutrition of mother and child: is it critical?

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Conventionally, chronic non-communicable diseases (NCDs) are thought to result from genetic susceptibility, aging and modern lifestyle. Hales and Barker demonstrated that low birth weight was a risk factor for diabetes and cardiovascular disease, which led to the theory of Developmental Origins of Health and Disease (DOHaD). Maternal nutrition is thought important in fetal programming of health and disease.
It is intriguing that the Indian subcontinent is the seat for highest number of low birth weight babies and is also the world's capital of diabetes. Studies in India have shown that low birth weight predicts increased risk of diabetes (Delhi) and cardiovascular disease (Mysore). In Pune we demonstrated that low birth weight was an independent risk factor for childhood adiposity, insulin resistance and other cardiovascular risk factors. Children born small but grown big had the highest risk.
Pune Maternal Nutrition Study was one of the first studies to investigate the effect of maternal nutrition on fetal growth and risk of NCD. We found that maternal consumption of foods rich in micronutrients predicted fetal growth. Maternal vitamin B12 deficiency was associated with intrauterine growth retardation, and childhood adiposity and insulin resistance, especially if maternal folate status was excessive. We have called this as 'nutrient mediated teratogenesis'. Research in Pune and Mysore also showed that vitamin B12 deficiency increase risk of maternal hyperglycemia, which in turn increased the risk of offspring adiposity and glucose intolerance ('fuel-mediated teratogenesis').
It is well known that maternal nutrition influences fetal development (folic acid prevention of nerural tube defects and effect of iodine supplementation on brain development). DOHaD research suggests it may also help reduce the burgeoning epidemic of chronic non-communicable disease.

No conflict of interest

0145

Postnatal nutrition: the good,bad and ugly

R. Raab[1]
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A Past Secretary-General of the International Society for Paediatric and Adolescent Diabetes stated:
'Nutritional management is commonly described as one of the cornerstones of diabetes care; unfortunately, it is the cornerstone which may be least understood, most under-researched, and to which there is the poorest adherence.'
The current recommendation for diabetes of 50% or more of daily calories from carbohydrate (approx 280 gms) is equivalent to 55 teaspoons of sugar or 4 glucose tolerance tests equivalent daily.
Smaller amounts of carbohydrate can result in the following advantages:

1. Greater accuracy in measuring the actual amount of carbohydrate in a meal
2. Smaller amounts of insulin and more predictability in insulin absorption
3. Less serious hypoglycaemia
4. Less delayed stomach emptying, a common, unpleasant and debilitating problem.

These produce more predictability, and less variation in blood glucose levels, and a better quality of life.
The high carbohydrate recommendations grew out of concern with the role of fat in contributing to heart disease. We now know that in fact 'healthy' fats provide protection. The calories from carbohydrate can be replaced with healthy fats such as, for example, avocado, olive oil in cooking and salads, and some types of fish, and many others, making the adoption in daily life of a low, or lower, carbohydrate regime quite easy.
Diabetes is a problem of carbohydrate intolerance and those who are pre-diabetic, susceptible to diabetes or the Metabolic Syndrome will also benefit significantly from a lower carbohydrate regime, and this can have a major role in responding to, and helping prevent, the current diabetes epidemic.

Reference
Dietary Carbohydrate Restriction in The Treatment of Diabetes and the Metabolic Syndrome ; Richard D. Feinman, PhD, Jeff S. Volek, PhD, RD, and Eric C. Westman, MD, MHS; Clinical Nutrition Insight Volume 34, No. 12; December 2008

No conflict of interest

0146

Quality, quantity and timing

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Diabetes is the commonest illness related to nutrition in both its aetiology and its management. Abnormal dietary habits, inadequate physical activity and psychosocial stress often contribute to its development. However, proper nutrition using simple guidelines of quality, quantity and timing are the main stay of non pharmaceutical lifestyle intervention in prevention.
The quality of the meals that we consume throughout life determines good health and protects us from illness. Good quality meals are often natural products, high in nutrition and fibre without any significant refining, polishing and extraction by man. Refined products such sugars, polished starches, oils and fats produce poor satiety resulting in increased consumption, frequent intake which leads to obesity with its high risk of developing T2DM.
Quantity of food intake is determined by the degree of refinement and the timing of meals. The more refined the product, the greater the need for increased quantity to obtain satiety. This will increase the frequency of intake resulting in excess weight gain and obesity.
Proper timing of meals to prevent excessive hunger is essential as it protects the person from frequent high calorie food intake. Modern lifestyle with its attendant pressures of work and study often predisposes to such irregular unhealthy eating habits.
What is good for a person living with diabetes is good for all.

No conflict of interest

0147

Combating obesity 'spare tyre checks' at motorway services

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[2] *University of Chichester UK, Obesity, Chichester, United Kingdom*

This work intended to look at how men perceive their health in relation to obesity.
This paper presents data collected from 266 men (19-84yrs) who visited MOTO service stations on motorway networks during the summer of 2007. Men were offered 'spare tyre checks' at a health check station making the data unusual in that it provides information from the general population and not those visiting clinicians.
The subjects had a number of health indices measured including; body composition by BIA (Tanita BC-420MA), waist circumference. They were also asked a number of questions regarding their perceptions of themselves in matters of health.
The subjects were found to be significantly ($t_{(263)}$= 25.04, p<0.001) overweight (23.01 ± 16.82 kg) and had a mean excess of 4.95 kg of fat. Paired samples t-tests revealed significant differences between their guessed waist and their real waist measurement ($t_{(263)}$=-18.69, p<0.001) with the average estimate being 3.4 ±3.7 inches under. As their waist circumference increased the men regarded their weight to be more important than waist circumference. Subjects were asked to categorise themselves in terms of their body composition. Of those with BMI's 30-35kg/m^2 89% underestimated their size, with 60% of those in the morbidly obese category of >35 kg/m^2 thinking that they were not obese.
The differences between perception and reality that individuals have is likely to have an impact on the effectiveness of any education and intervention programme as they will deem the information or process the information more or less relevant to themselves.

No conflict of interest

WORKSHOP

ASSOCIATION DEVELOPMENT

Empowering associations to overcome local problems

0148

How to make diabetes care affordable, available and accessible

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Diabetes, one of the chronic diseases affecting humans, is unfortunately on the rise globally. This increase signifies that worldwide, more persons are in need of education, information, medication, and testing supplies to cope with this condition.
While there may be ethnic groups that show significant susceptibility to Diabetes, on an average, this condition does not discriminate. Diabetes affects persons from diverse ethnic groups and socio economic status.
Although Diabetes has been around for many years, and there have been varied treatments, and various testing equipment, the costs continue to be exorbitant. Undoubtedly, the socio-economic condition of a country impacts the level of healthcare that can be made accessible to its people. Persons in the lower and middle income bracket, often make difficult decisions on whether to spend on food or medication. In many instances the choice is to obtain the food and not the medication.
This presentation seeks to identify ways of making Diabetes Care **Affordable**, **Available** and **Accessible** to persons of all walks of life.
It is evident that no one entity can adequately address the aforementioned issues and derive equitable solutions that would be favorable to all concerned. In this era of global recession it's prudent that all bodies concerned join forces for the good of humankind.
This presentation looks at the role of governments, the pharmaceutical companies, Diabetes Associations and other private entities in making Diabetes Care attainable to all.

No conflict of interest

0149

Taking diabetes care to the people: change in management paradigm, not the problems of diabetes, but the solutions

S. Bahendeka[1]
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Management approaches of diabetes have traditionally been centred on problems resulting from the effects of diabetes; highlighting known solutions to these problems and health care providers being the most important source of information, with little emphasis on expanding the diabetic care services into the community settings. However, to create a healthy community, the entire community needs to take an active and positive role in changing those community factors that continue to place people at risk. Furthermore there is evidence that interventions are more likely to see successful reduction in rates of onset and progression of diabetes by developing services and resources tailored to the needs of various communities, whether based on income, language or diabetes type, as well as other factors. In the community approach (taking diabetes care to the people), the goal in the management of diabetes is to empower those with diabetes, their families, health professionals, and others at the community level, including families, schools, work sites, local government, and community organizations to work together to prevent and control diabetes. This involves (i) promoting healthy behaviors to prevent type 2 diabetes and other chronic diseases, (ii) implementing education and support programs for people with diabetes, (iii) convening a coalition to address the issues of diabetes in the community, (iv) creating and publicizing a profile of the impact of diabetes in the community, (v) providing diabetes education and training for health professionals, (v) facilitating improvement of diabetes care in clinical settings and (vi) identifying barriers and disparities of access to health care and eliminating them. In order to continue this positive trend there is need to shift the diabetes management paradigm from the traditional health care provider centred approach to solutions derived and generated by the community working together with the health care provider.

No conflict of interest

WORKSHOP

Improving wider aspects of the management of type 1 diabetes

0150

Peer to peer program for type 1 diabetes patients and their families

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Thousands of injections and blood monitoring in a year, transform the parents of a diabetic boy and the diabetic himself, into true experts in the subject. In addition they have had to take thousands of decisions, how much to eat, what insulin to vary and with the advantage of being able to state in the act the result of these decisions.
And this is a fact that all the healthcare team respects. For them it is impossible to equal all that for the simple reason that they do not have a diabetic at home. This is an essential fact, since if is wanted that the intervention of the peers is successful, these will have to limit its action to transfer its experience in daily life, leaving, as already we said, the formal education to the experts. This produces a very good relation with the healthcare team in hospitals and clinics, they recognize the complementary thing and valuable that it is this contribution and by the same they accept its intervention inviting them to participate from the diagnosis.
The fact that the peers do not make education formal it does not mean that they cannot collaborate in it. Peer´s organizations can be facilitators of the formal education, providing doctors, dieticians, nurses, physical therapists and others, of classrooms and educative material equipment and compiling of all nature.
The educative activities through their peers must be oriented to fulfill 3 great objectives very precise and that they are: **to accept** diabetes- **to learn the day-to-day practice** of the treatment - **to persist** in the treatment.

No conflict of interest

0151

Competition in schools "my knowledge about diabetes": raising diabetes awareness for teachers and children

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[1] Slovenian Diabetes Association, Ljubljana, Slovenia
[2] University Clinical Centre, Metabolism and Endocrinology, Ljubljana, Slovenia

There are more than 600 diabetics in Slovenian schools. Good treatment and knowledge about diabetes, self management, their peers and all people around them (including teachers) understanding of disease and properly acting are essential so that their life, work and results do not differ from those of their classmates.
One of educative and preventive actions in primary and secondary schools in Slovenia is competition »my knowing about diabetes«. Aims and goals of this competition are raising diabetes awareness, spreading and deepening the knowledge about diabetes and about the lifestyle preventing the onset of type 2 diabetes, comparing school children's knowledge, raising motivation for further knowledge deepening and gathering the youth from different schools and settings.
Competition is one of the most popular school voluntary events in Slovenia. Contestants are children from 13 to 17 years, attending the primary and secondary schools. Slovenian Diabetes Association organises every year the education of mentors - teachers in children's home schools, who prepare them for competition, edits the "Spelling book about diabetes" which explains diabetes, its complications, treatment and life style for children, sets up for mentors papers with more elaborated data about the issues determined for year's competition (the year's IDF theme), settles complementary literature and prepares tests for competition.
The competition takes place on two levels: first, contestants complete tests in children's home schools. The 3 best contestants from each home school attend the republic competition. Participants can gain bronze (in home schools), silver (> 80% points) and gold (>90 % points) awards.
In 11 years the number of participating schools and children is increasing constantly, likewise the winners of bronze, silver and gold awards. Last year 380 schools and 7623 contestants took part in competition. Teachers identify this competition as very useful and children as "learning for life".

No conflict of interest

SYMPOSIUM

Associations and relationships with industry

0152

Our experience of dealing ethically with industry: lessons for other associations

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Diabetes in Denmark
Denmark 2008: Approximately 240.000 diagnosed with diabetes. Among these 90 – 95 % is type 2-diabetics. Estimation for 2025 is 600.000.
The Danish Diabetes Association has three strategic goals
1. To prevent diabetes and the side effects of the disease
2. To secure the best possible life for people with diabetes
3. Finding a cure for diabetes

Main challenges to reach our goals
At the moment the main challenges for the association is to ensure further means both financially and regarding manpower and to ensure the necessary skills, both in house and externally.
Means to reach the goals
To reach ours and government's goals we involve both the civic society; the public service and business partners. Public- private and NGO must collaborate.
Specifics on collaboration with industry
Ethical base:
- Independence
- Openness and transparency
- Respect for DDA's professional guidelines and recommendations and
- Partners must engage in optimizing DDA's strategies.

Examples
1. The Diabetes Forum – with the support of Novo Nordisk. The seminar was the first of its kind in Denmark with participants from the healthcare sector, the public sector, politicians, industry, unions, NGO's and members from the Danish Diabetes Association. Result: Focus on the gravity of diabetes to society and elaboration of specific recommendations on how to improve the prevention and treatment of diabetes, how to improve the tracing of the many that has diabetes without knowing.
2. Club 20 – a club for businesses and industry with member fee. Result: Fine support from industry, but it's a new initiative and it hasn't been evaluated yet.

Lessons learned
State your reason and ethical base
Ensure clear contracts and clear communication
Don't be afraid to interact

No conflict of interest

0153

Should industry play a role in helping poor and transitional countries?

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It is only by the years 1970 – 1980, that in the poor countries emerged some associations conducted by some doctors totally motivated for the cause of diabetes. They were accompanied by some distinguished personalities from the civil society who are ether diabetics themselves or parents of diabetic persons. Consequently, the relations of the patients' associations with the industries on one hand with the other partners interested in the domain on the other hand are promoting.
The associations must provide the industries partners with a balanced approach which will introduce the action plan containing well specified and relevant objectives. The action plan will be publicized through direct writing, lectures, and through the local newspapers.
One of the numerous problems that the poor countries are facing is that of the high cost of the screening, the early education and early sensitization of the population. In these countries, there are many diabetic people who are not diagnosed. Those who are diagnosed cannot afford the treatment or a good care. The situation should bring the industries to much more responsibility.
They should engage actively not only financially, but also they should support the existing diabetes associations by taking part into the promotion, the development and the achievement of the health national programmes already established by these organisations.
The associations should be a focus point where all the parties involved in the fight against diabetes meet (industries, governments etc…) in order to submit to them the claims and needs of the diabetic people.
Therefore the industries operate in a transparency mode by presupposing a common goal shared with the associations such as: the information about the prevention, the screening, the available treatments, the hopes for new therapies, the accessibility to the most adapted cares.
The industries and the patients associations in the poor and emerging countries must maintain good relation so as to promote the health system in these countries.
The role of the industries is capital to the achievement of a better efficiency.

No conflict of interest

0154

Association-industry interactions: the do's & dont's

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[1] Ministry of Health, Health Surveillance, St Georges, Grenada
[2] St. George's University, Nursing, St Georges, Grenada

Background: Diabetes associations of North America and the Caribbean interact in various degrees with industry to implement public awareness, education, prevention and control of diabetes and its complications throughout the region.
Aims: To obtain information on the nature and scope of interactions between diabetes associations and industry, and to suggest guidelines concerning these relationships.

Methods: A questionnaire was developed and administered to representatives from 14 diabetes associations of the North America and Caribbean region (Jamaica, British Virgin Islands, Anguilla, Canada, USA, St. Lucia, Bahamas, Guyana, Barbados, Grenada, Trinidad& Tobago, Haiti, St. Martin, St Kitts/ Nevis.) Management from pharmaceutical companies, the banking industry and government ministries were interviewed to better understand the range of services and relationships in place.
Results: All but two of the associations interviewed interacted with industry, Relations involved implementation of screening and educational sessions for workers, groups, organization and general public. Training of diabetes educators. Subsidized products for members of diabetes associations, sponsorship of t-shirts, souvenirs, supply of equipment and supplies for screening, trophies, gifts, and refreshments at health promotional events; also interaction in sponsorship of youth camps, workshops, seminars, symposium, Sponsorship of educational materials, for healthy lifestyle promotion.
Strong, positive relationships between associations and industry seem to be based on respect, ethical standards and transparency in practice. Conflicts of interest, self promotion and lack of mutual benefit were viewed as hindering these relationships.
Conclusions: Association and Industry collaboration can bring tremendous benefits to people living with diabetes and those at risk. There must be mutual respect and consideration by all involved. Both association and industry must demonstrate management, financial and ethical responsibility. Working together can enhance the partnership between association and industry at all levels: locally, regionally and internationally.

No conflict of interest

0155

How should associations deal with the power of industry?

N. Tukayevskaya[1], *Y. Kugayevskaya*[1]
[1] *Diabetic Association of the Republic of Kazakhstan, leading office, Almaty, Kazakhstan*

Diabetic Association of the Republic of Kazakhstan (DARK) - year of foundation is 1995. Number of members (legal entities) in 2009 - 33, 12 of them are representatives of industry.
Years of Association foundation coincided with creating of independent Kazakhstan. Problem – imperfect budget process. Failure in diabetes financing. Fatal cases because of diabetic coma have been recording. Covering necessity in insulin is 25-30%. Association accepted assistance from pharmacompanies to prevent deaths.
Decision to accept assistance entails effort of pressure to Association from pharmacompanies with a purpose of their interests lobbying on market.
Association decided to operate only for patients. Politics - banning of monopoly, interests of patients are priority, Association members equality of rights, not depended on status, joining of new members, including competitors on market. Reasoning of Association decision and collective nature in working out of strategy, openness, clarity and incorruptibility.
Results:

- Creating of definite independent image of Association in all levels of authorities and in all fields of activity, and as a result partners from business not connected with pharm activity appearing.
- Diabetes financing growth (from 300 thousand till 17 000 000 $USA).
- Improving of patients with diabetes mellitus situation in RK.
- Making partner relationships with\between members of Association
- Changing of competitive companies, included in Association to "fair competition" strategy.

Conclusions: for independence of Association, especially for again founded it's necessary the following:
Clear understand and realize the mission of organization.
Financing from sources unconnected with commercial field. Here IDF can play a major role, providing financing assistance and attracting international funds.

No conflict of interest

OPEN FORUM

LIVING WITH DIABETES

Living with someone with diabetes: challenges and solutions

0156

Helping a child with diabetes to lead a normal life

G. Parfitt[1]
[1] *Gwent Healthcare NHS Trust, Women Child and Family Division, Newport, United Kingdom*

Aim: This intervention ensures cooperation between schools, healthcare providers and families in caring for children at school who require lunch time insulin injections.
Method: Healthcare professionals provide training to designated school staff to administer insulin to children with diabetes. Interdisciplinary team working is essential for this venture.
A teaching package has been developed specifically for schools to ensure that insulin can be delivered safely by volunteers. This mirrors the teaching given to the families, ensuring consistency in the information given and care provided. Teaching is adapted and an individualised teaching package is offered to suit the needs of the child and school. This ranges from basic injection technique in contrast to dose adjustment of insulin to carbohydrate.
Results and discussion: This initiative is effective and currently 21 junior schools are administering injections, 11 supervise children administering their own injection and 5 have declined to participate in the initiative.
This initiative is successful because the co-ordinated training package provides the appropriate skills to develop confidence, allowing the volunteers to successfully administer insulin.
However in the United Kingdom there is no legislation to ensure that all children have support in schools for diabetes care, allowing some schools to opt out of this initiative.
Conclusion: School involvement ensures children are not discriminated against because of diabetes. It is still not normal practice for young children to be offered this support in schools. Reasons for this are multifactorial and include reluctance from schools, lack of enthusiasm from healthcare professionals and a lack of cohesion between education and healthcare.
This is a practical and effective intervention and in Wales we have developed a working partnership between education and health to try and overcome these obstacles. We hope that this will lead to guidelines for Wales which will allow equity of diabetes care in schools.

No conflict of interest

0157

Perspective of a parent and siblings

N. Hirst[1]
[1] *Stirlingshire Scotland, United Kingdom*

In her presentation Naomi Hirst will chart her family's diabetes journey over the past twenty five years since her youngest child, Kate, was diagnosed with type 1 diabetes at the age of five.
Her principal focus will be on the role of parent and carer, and the imperative of the person living with diabetes to have someone to provide care and support, whether it be parent, partner, sibling or friend. She will talk of her own experiences in balancing that care with the emotional turmoil which so many carers can feel.
The three issues which she will highlight are:

- The issue of denial both on the part of the person with diabetes, and on the part of the carer, for both can experience denial.
- The issue of transitional care which can be perplexingly inadequate. At a time of adolescence, it is vitally important that when young people move from paediatric care to young adult care, their care arrangements are handled with sensitivity. The needs of both the young person and their carer are important, and nothing should be done which undermines the strength of the 'triangle of care' between the young person, their carer and the clinician.
- The Type 3 diabetes issue. There is an absolute need for the young (and not so young) person with diabetes to have someone close who is their carer - in a supportive and caring, but not controlling and critical, role.

No conflict of interest

0158

Spouse or partner

B. Brameijer[1]
[1] *Keperra, Australia*

In 1998 I was faced with the possibility of diabetes. I already had some basic knowledge through First Aid training and a relative with diabetes, however I had never thought I would be so directly involved. Information sent by the Diabetesvereniging Nederland was valuable and helpful. Nevertheless, I could not have prepared for what was to come.
Six months later, upon marrying and moving to Australia, it was confirmed: 'Type 3 Diabetes'. Suddenly I was living with daily blood glucose monitoring, insulin injections, counting carbohydrates, reading food labels, dealing with hypos, ensuring there was always hypo food available, and of course, never forgetting the Glucagon Hypokit! On top of that were all the diabetes complications with their resultant additional problems - blindness, renal failure, peripheral and autonomic neuropathy, gastroparesis, a diabetic breast lump, the endless doctor and specialist appointments and the too frequent hospital admissions.
But, I wasn't the one with the elevated blood glucose levels, or the lifetime of Type I Diabetes, it was my wife, Janelle. Living with a person with diabetes, is also living with diabetes - every minute of every day, through every hypo and every complication.
Janelle refers jokingly to my condition as 'Type 3 Diabetes'. Her diagnosis is "the person 'Living with Diabetes' while not clinically being diagnosed with diabetes".

No conflict of interest

DEBATE

Aetiology of type 2 diabetes - genetics vs environment

0159

Genetics

V. Mohan[1]
[1] *Madras Diabetes Research Foundation & Dr. Mohan's Diabetes Specialities Centre, Department of Diabetology, Chennai, India*

Type 2 diabetes (T2DM) is a multifactorial disease with a strong genetic component. Evidence for the genetic basis for T2DM comes from studies on familial aggregation, twin studies and more recently, genetic studies. The concordance rates for type 2 diabetes among monozygotic genetic twins is 80-90% whereas it is only 40-50% dizygotic twins, thus showing a strong genetic component. The role of genes in T2DM is further exemplified by the fact that not all obese people develop diabetes. It is the ones who have a family history of diabetes (ie., a genetic component) who develop the disorder. The genetics of T2DM has been difficult to dissect out because it is a polygenic disorder with number of genes on multiple chromosomes and the effect of each of these genes is rather modest. Moreover, small sample sizes, case mixes different definitions used and ethnic variations have all being confounding factors. Recently, however there have been rapid advances in the genomics of T2DM, thanks to genomewide association studies (GWAS). Almost a dozen genes have been associated with T2DM through GWAS. However, the TCF7L2 gene has emerged as a strongest genetic marker in T2DM. However, even this gene only has an effect size of 1.2 to 1.6 in different studies. It is thus clear that multiple genes each with a modest effect contribute to the overall genetic risk of developing T2DM. Gene gene and gene environment interaction make the situation even more complex, and complex analytic skills are needed to determine the genetics of T2DM.

No conflict of interest

0160

Environment

A. Basit[1]
[1] *Baqai Institute of Diabetology & Endocrinology/Baqai Medical University, Department of Medicine, Karachi, Pakistan*

Gene-environment interactions play a major role in the aetio-pathology of Type 2 Diabetes (T2DM). Environmental factors like high calorie diets and reduced physical activity definitely contribute to the increasing prevalence of obesity and T2DM.The thrifty phenotype hypothesis proposed the concept of environmental 'programming' suggesting the existence of developmental windows during which exposures 'set' physiological systems and hence long-term consequences. Extremes of maternal age is also found to be a contributing factor to low birth weight. The protective effect of breastfeeding for childhood obesity and T2DM has also been observed. High prevalence of the disease in the offspring of gestational diabetic mothers or concordance rates of T2DM in identical twins further suggests intrauterine environmental influences. Predictive Adaptive Response hypothesis proposes that the fetus dynamically interacts and reads the environment which it will be born into and adapts to gain a future survival advantage. Environmental pollution and infectivity has also been proposed in certain studies to stimulate the fat cells to secrete molecules that promote insulin resistance, endothelial dysfunction, coagulation disturbances and a proinflammatory state, leading to type 2 diabetes and CHD. Role of stress and depression in the development of T2DM is being implicated. The successes of primary prevention trials in T2DM supports the notion that environmental influences were a cause of their T2DM and encourages further to concentrate on earlier interventions. Better understanding of aetio-pathological environmental factors is suggesting prevention should begin much before the stage of IGT, and interventions in high-risk subjects i.e. families of people living with diabetes alone will not be sufficient. It is necessary to initiate population based programmes for primary prevention of T2DM and must include a range of activities targeted at different age groups from fetal life to old age.

No conflict of interest

TUESDAY 20 OCTOBER

SYMPOSIUM

CLINICAL RESEARCH

Diabetes and obesity management: fat distribution, bariatric surgery, obesity drugs as glucose-lowering drugs, appetite control in diabetes

0161

Bypass, hormones and type 2 diabetes

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Bariatric surgical procedures have been shown to dramatically improve glucose metabolism in severely obese patients with type 2 diabetes. Consistent reports demonstrate that certain types of surgical procedures reverse metabolic alterations and improve insulin sensitivity and first phase insulin secretion. Experimental studies in animals as well as clinical trials suggest that the clinical and metabolic effects of gastrointestinal bypass procedures are independent of and additive to body weight loss.

Many neural and endocrine gut signals are physiologically important in the regulation of energy homeostasis, body weight, glucose tolerance and insulin secretion, hence, altered gut hormone secretion after gastric bypass procedures offers a plausible explanation of the mechanism by which these procedures achieve diabetes control. Recent research studies suggest that different types of manipulation of gastrointestinal anatomy may activate distinct hormonal mechanisms, which may explain variability of diabetes control across surgical procedures. Operations, characterized by the bypass of proximal small bowel appear to enhance physiologic signals that promote insulin secretion; however, other observations also suggest the possibility that these operations can possibly tackle intestinal dysfunctions that contribute to the pathophysiology of insulin resistance, diabetes and obesity.

In this presentation we discuss the available evidence on mechanisms of diabetes control after gastric bypass surgery and present the hypothesis that dysfunctional intestinal signals may be involved in the underlying pathophysiology of diabetes.

Conflict of interest:
Advisory board: GI Dynamics
Other substantive relationships: Consultant fee: Covidien, Ethicon, NGM Biotech

0162

Fat distribution and metabolism

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Numerous studies have shown that ***in vivo*** insulin resistance is a key feature of an atherogenic, pro-thrombotic and inflammatory profile which has been first described as "syndrome X" by Reaven and then referred to as the insulin resistance syndrome or the "metabolic syndrome" by others. Some investigators have suggested that the most prevalent form of this constellation of metabolic abnormalities linked to insulin resistance was found in patients with abdominal obesity, especially with an excess of intra-abdominal or visceral adipose tissue. We have previously proposed that visceral obesity may represent a clinical intermediate phenotype reflecting the relative inability of subcutaneous adipose tissue to act as a protective metabolic sink for the clearance and storage of the extra energy derived from dietary triglycerides, leading to ectopic fat deposition in visceral adipose depots, skeletal muscle, liver, heart, etc. Thus, visceral obesity may partly be a marker of a dysmetabolic state and partly a cause of the metabolic syndrome. Although waist circumference is a better marker of abdominal fat accumulation than the body mass index, an elevated waistline alone is not sufficient to diagnose visceral obesity. We have proposed that an elevated fasting triglyceride concentration could represent, when waist circumference is increased, a simple clinical marker of excess visceral/ectopic fat. Finally, a clinical diagnosis of visceral obesity, insulin resistance or of the metabolic syndrome is not sufficient to assess global risk of cardiovascular disease. In order to achieve this goal, physicians should first pay attention to the classical risk factors while also considering the additional risk resulting from the presence of abdominal obesity and the metabolic syndrome, such global risk being defined as cardiometabolic risk.

No conflict of interest

0163

Fat reduction surgery and its metabolic consequences

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Medically-significant obesity can be defined as an excessive amount of body fat, which increases the risk of medical illnesses and premature death. Bariatric surgery is the most effective available fat loss therapy for obese patients. Proceedings from a National Institutes of Health Consensus Conference reported in 1991 concluded that eligible patients for bariatric surgery were those who were morbidly obese, defined either as those with a BMI ≥40 kg/m^2 or those with a BMI of 35 to39.9 kg/m^2 plus ≥1 severe obesity-related medical complication. Fat loss induced by bariatric surgery in morbidly obese patients effectively reverses or improves the medical complications associated with obesity, even though most patients remain obese. The metabolic complications of obesity, namely insulin resistance, diabetes, dyslipidemia, and increased blood pressure are improved or completely resolve after bariatic surgery induced weight loss. We have found that bariatric surgery-induced weight loss normalizes insulin sensitivity in liver, adipose tissue and skeletal muscle, decreases hepatic VLDL-triglyceride secretion rate, decreases liver fat content and the hepatic cellular factors involved in inflammation and fibrogenesis. In contrast, surgical fat removal of ~10 kg of subcutaneous abdominal fat by large-volume abdominal liposuction did not improve the metabolic abnormalities associated with obesity. The absence of a therapeutic effect suggests that losing weight by inducing a negative energy balance, not by decreasing adipose tissue mass alone, is critical for achieving the metabolic benefits of weight loss.

Conflict of interest:
Advisory board: Johnson & Johnson - Scientific Advisory Board

0164

Drug therapy

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Obesity is closely related to type 2 diabetes and sustained weight reduction is an important issue of the care delivered to obese subjects with diabetes. It is also well known that weight management may be the most important therapeutic task for most obese subjects with type 2 diabetes. On the other hand, the past ten years have been the golden age of obesity research with the enormous and increasing understanding of the mechanisms implicated in the energy balance control. It is now recognized that there are several central and peripheral factors involved in energy homeostasis, and it is expected that the understanding of these mechanisms should lead to effective treatments for the control of obesity and type 2 diabetes. However, nowadays, the approach to the pharmacological treatment of obesity is based upon few traditional and historical drugs. In particular, the drugs currently available are working via the serotoninergic and noradrenergic pathways, whereas those inhibiting nutrient absorption are locally acting as enzyme blockers. Their use in obese diabetic patients has been validated by a series of studies all resulting in modest outcome in both body weight and glycaemic parameters. Great hope has been generated, nevertheless, by the ability of the GLP-1 analogues to reduce body weight in association to the well-defined effect on glycaemia and insulin, and their effect in the context of body weight reduction will be critically discussed in the lecture. Finally, other therapeutics actually under investigation in clinical trials, that would either reduce appetite or enhance energy expenditure actually, will be also discussed in their pros and cons in the presentation.

No conflict of interest

SYMPOSIUM

Medical treatment of diabetic eye disease

0165

Community screening for retinopathy

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Diabetic retinopathy (DR) is the leading cause of blindness in the 20-74 age groups. Regular screening is the most efficient and cost-effective way to detect its early stages. Ideally screening should be done by ophthalmologists, which is not affordable in many countries.
Community based screening is a method through which majority of patients are screened, provided that points of delivery are easily reachable. Methods of community screening include; well trained clinicians in Primary Health Care centers (PHC) with a non-mydriatic digital camera, mobile units, camps, and through optometrists. Kuwait, with its 36 diabetes clinics, within the PHC, distributed all over the country. All clinics are easily accessible and has a call and re-call system. This Kuwaiti set-up can represent a good model for community screening. DR Screening services started since 2001 with 16 digital cameras distributed in these clinics run by trained clinicians, periodically supervised by experienced ophthalmologist, with Referrals to ophthalmology center for severe cases according to a national guideline. In one clinic 7000 patients were examined in the first 3 years. 10.4% had any degree of DR, 50.5% of them were referred.
Another example for community screening is the Kuwait Diabetes Society (KDS) camps where screening for DR is one of its activities. 237diabetics examined in several camps over a 3-years period, 22.8% had DR, 30.2% had their last examination more than 2 years ago, and 32.9% were never examined before. In 2001 the rate of examination was 6.8% increased to 31.6% by 2003. Implementing such programs could increase compliance with guidelines among people with diabetes that had not a recent retinal examination.

No conflict of interest

0166

Medical treatment of eye disease: can we treat diabetic retinopathy medically?

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Retinopathy is the most frequent complication of diabetes and, although relatively easy to recognize and treat, remains an important cause of blindness in working age and, increasingly, later in life.
Retinopathy is the consequence of 3 types of alterations in retinal capillaries: occlusions, increased permeability and, at later stages, new vessel formation. Occlusions cause areas of non perfusion, associated with microaneurysms, haemorrhages, cotton wool spots and vessel dilation. Leakage from the capillary wall results in edema and hard exudates. Such lesions may evolve towards two sight-threatening, non mutually exclusive presentations: diabetic maculopathy and proliferative retinopathy. In the former, edema and exudates encroach on the macula and cause loss of central vision, especially in type 2 diabetes. In the latter, new vessels arisen in response to ischaemia may bleed and cause fibro-glial proliferation, ultimately leading to retinal detachment.
Our main instrument to prevent blindness is laser photocoagulation. This is most effective when applied before loss of vision. Hence, regular screening for asymptomatic sight-threatening retinopathy is imperative in diabetes care. Recently, intravitreal injection of steroids or anti-VEGF agents has become widespread in the treatment of the most severe cases of retinopathy. Vitreoretinal surgery is applied in selected situations.
There is room for medical intervention, too. Optimised control of blood glucose and pressure, although difficult to achieve, results in effective primary and secondary prevention of retinopathy. More targeted treatments have been subjected to trial. Blockade of the renin-angiotensin system by candesartan resulted in prevention of new retinopathy in type 1 diabetes and regression in type 2. Inhibition of protein kinase C-beta by ruboxistaurin reduced visual loss in patients with macular edema. Finally, fenofibrate slowed progression of retinopathy and need for laser treatment independently of its metabolic effects. Further research is clearly needed to identify pathogenetic mechanisms that can be more effectively targeted.

Conflict of interest:
Paid lecturing: Lectures on the DIRECT trial for Astra Zeneca and Takeda Advisory board: Steering Committee of DIRECT, sponsored by Astra Zeneca and Takeda. Participated in Advisory Boards on Ruboxistaurin, supported by Eli Lilly.

SYMPOSIUM

EDUCATION

IDF global diabetes education activities

0167

Implementing diabetes education in the context of the UN resolution

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The United Nations resolution on diabetes makes two statements that are directly related to education.

- "Recognizing the urgent need to pursue multilateral efforts to promote and improve human health, and **provide access to treatment and health-care education**."
- "… observe World diabetes day in an appropriate manner, in order to **raise public awareness** of diabetes and related complications, as well as its prevention and care, including through education and the mass media"

This session will explore issues of access to care and education, such as cost, distance and availability of health care providers who are able to provide care and education according to the IDF guidelines. The session will also address issues related to increasing public awareness, how it is done, what difference it makes, who should be targeted and the roles both professionals and non professionals play in raising public awareness through education and mass media. Strategies developed and undertaken within different IDF Regions in an attempt to increase the education and therefore accessibility of those providing care will be discussed. As well public awareness campaigns, on a large scale such as World Diabetes Day, and on a small scale such as training peer educators to work in the community will be highlighted and discussed. Implementing diabetes education must be multi-faceted, it must be done on both the world wide and the local stage and must include both professionals and non-professionals.

No conflict of interest

0168

National insulin program in Turkey: the snowball effect

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Introduction: While diabetes is spreading around the world rapidly, improving the knowledge and skills of the insulin therapy among the health care professionals(HCPs) through continued education plays a critical role in diabetes management.
Aim: National Insulin Education Program in Turkey was designed to increase the knowledge of insulin therapy and reduce potential mistakes during implementation among nurses.
Method: An educational kit consisting of the components below was prepared for the HCPs as part of their post-graduate training:

1. Training Slides: Adapted from on the IDF Diabetes Education Module and based on the practical prospective from diabetes educators.
2. Educators' Manual: Provided guidelines for the trainers.
3. Instructions and Letters: Sent to the educators and directors of hospitals to introduce the program, its protocol and evaluation.
4. Handouts: Covered four subjects: insulin injection, lipodystrophy and site rotation, injection devices, and 10 rules of insulin implementations.
5. Pre-test & Post-test: Conducted a pre-test benchmarking and a post-test in 3 months after training.

All hospitals in Turkey were invited to enroll in these two or three hours training programs which were given by diabetes nurses to the nursing staff from various departments such as surgical, oncology, and neurology.

Results: 9,000 nurses were trained by 250 diabetes nurse educators in 54 cities, 125 hospitals. 7,200 participants were evaluated by pre-test, of which 45% completed their post-test. Preliminary results showed positive feedback from participants. They found the program content and educational kit practical, reliable, and useful for their daily practice.
Conclusion: The education program was organized by Turkish Diabetes Nursing Association with collaboration of IDF and Turkish Ministry of Health. It received a great acceptance and participation from nurses. Although the program has ended, there are still many new applications for training. The program was supported by an unrestricted educational grant of Lilly.

No conflict of interest

0169

Developing a certification program in UAE

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Aims: Driven by the high prevalence of diabetes mellitus in the UAE and the scarcity of certified diabetes educators, the Faculty of Medicine and Health Sciences (FMHS), UAE University and the Emirates Diabetes Society (EDS) conducted two diabetes education courses in collaboration with the Diabetes Education Consultative Section (DECS) of IDF. These courses were based on the IDF curriculum for Diabetes Health Professional Education and aimed at educating and certifying health care professionals who work directly in diabetes education or interact with patients suffering from diabetes.
Methods: The first course was a 5-day program held in Al Ain in 2006. The second course was a 3-day program held in Dubai in 2007. Both courses were delivered by DECS members. A third course, organized by the Juvenile Diabetes Education Center, EDS and FMHS, started in April 2009 in Dubai and will run weekly for one year. An application was also submitted to IDF for recognition of this course.
Results: Fifty-six students attended the first course and 60 attended the second course. They mainly consisted of nurses, dietitians, and pharmacists. Their level of diabetes knowledge varied from very good to minimal. Application of the knowledge in teaching the patient and fostering behavior change was new to most. The concept of working with the patient to see what he/she wants to do and is willing to do was new to many of them. Twenty-six of the 31 students who wrote FMHS certifying examination passed. Eighty students are currently enrolled in the third course which consists of didactic teaching, group work and clinical experience. This course will also be followed by FMHS certifying examination.
Conclusion: Diabetes education and certification is highly demanded especially in countries with high prevalence of diabetes. In our experience, courses based on the IDF curriculum are both effective and rewarding.

No conflict of interest

0170

Education for educators in South Africa – "agents for change"

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Non communicable diseases such as diabetes do not head the list of priorities for the health system in South Africa. Few diabetes educators are available to provide this integral part of patient care and self management. The majority work in the private sector (which caters for ~20% of the population) and tertiary institutions; there are none at primary care level where the majority of patients receive their care.
Since the initial diabetes course in 2006 run by Anne Belton and Kavita Kapur, two initiatives followed using the IDF curriculum:

1. Two day workshops run in different provinces, particularly in rural areas, using the services of Government, Diabetes South Africa, University of Cape Town and industry. The theme is "Agents for Change", ie changing from unhealthy to healthy lifestyle, starting with myself - being a role model to my family, my patients and the community. There have been 266 professional nurses, 24 health promotion assistants and 32 community health workers trained using this programme. A sample of measurements taken from 74 professional nurses participating in the courses shows high levels of obesity-only three had a normal BMI and the six with known diabetes had poor glycaemic control (random blood sugars ranged between 12.1-20.1 mmol).
2. The development of a 3 day introduction and 6 months course for professional nurses developed by the Diabetes Education Society of South Africa (DESSA). Although these trained nurses do not become Accredited Diabetes educators, they acquire a sound diabetes knowledge.

Conversation Maps have recently been introduced and 120 professional nurses have been trained to date.
Enormous challenges remain, in particular lack of accreditation for diabetes educators by health authorities.

Conflict of interest:
Other substantive relationships: These initiatives have been supported by Novo Nordisk, Diabetes South Africa, Roche Diagnostics, Eli Lilly and Lifescan

SYMPOSIUM

LIVING WITH DIABETES

Primary prevention of type 2 diabetes: drugs vs lifestyle

0171

DPP

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The worldwide epidemic of type 2 diabetes continues unabated with a projected prevalence of more than 250 million people in the next decade. The risk factors for diabetes that appear to apply to all populations, in the setting of polygenic risk, include sedentary lifestyle, increasing body fat, and ageing. The current inability to modify genetic risk and the lack of enthusiasm to shorten lifespan as means of confronting the diabetes epidemic have translated into efforts to ameliorate those environmental factors that underlie the epidemic and to determine whether lifestyle interventions or medications can reduce the development of diabetes. Specifically, lifestyle programs to increase activity levels and reduce body mass have been studied to determine whether and to what extent they can prevent or delay diabetes. In addition, metformin, the alpha-glucosidase inhibitor acarbose, and the thiazolidinediones have been studied.
The largest of the diabetes prevention studies, the Diabetes Prevention Program (DPP), randomly assigned participants to a lifestyle intervention program, metformin, troglitazone, or placebo (the troglitazone arm was terminated prematurely owing to concerns over potential liver toxicity). The main study results were published in 2002 demonstrating a 58% and 31% reduction in cumulative incidence of diabetes with lifestyle and metformin, respectively (N Engl J Med 2002;346:393). Subsequent publications have examined the mechanisms of prevention and other study results including: the effects of the interventions on metabolic syndrome and cardiovascular disease risk factors; results in older participants and those with prior GDM; the identification of genetic risk factors and interaction between genetic risk and the interventions; and health economic analyses. Longer-term follow-up results of DPP (DPP Outcome Study) have also been published.
This presentation will review the available clinical trial data that demonstrate the pluripotent effects of lifestyle and medication interventions in the prevention of diabetes.

No conflict of interest

0172

IDPP

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Background Primary prevention of diabetes is of utmost importance in India, where diabetes has reached epidemic proportions.
Objectives: IDPP-1 and IDPP-2 assessed the feasibility and the ideal tool for prevention of diabetes in subjects with Impaired Glucose Tolerance (IGT).
Methods: In IDPP-1, a 3 year community based prospective study, 531 IGT subjects were randomized to receive either life style modification (LSM) or metformin (500mg/d) or combination of both and a standard care control group. Intervention groups received repeated motivation. In IDPP-2, another cohort of 407 IGT subjects were randomized to receive LSM and placebo or

LSM + Pioglitazone (30mg/d). Incidence of diabetes was assessed annually for 3 years. Influence of weight change, intervention regimen, changes in insulin secretion and action on incidence of diabetes were assessed using appropriate statistical analysis. Changes in lipid parameters and blood pressure were also assessed.

Results: Moderate, but consistent LSM and metformin were equally effective in reducing incidence of diabetes (28.5% and 26.4% relative risk reduction in 3 years), but no added benefit occurred with the combination. Intervention strategies caused improvements in insulin secretion and action which occurred without significant weight reduction. Benefits were seen on atherogenic phenotype of lipids, but not on blood pressure. Results of IDPP-2, confirmed the beneficial effect of LSM on incidence of diabetes, but no additional benefit was obtained by adding pioglitazone (LSM- cumulative incidence 31.6%, pioglitazone – 29.8%, p = 0.665)

Conclusions: LSM is the choice of intervention in Asian Indian IGT subjects. Metformin in small doses is also useful. However, no additional benefits are obtained by combining metformin or pioglitazone with LSM. Collateral benefits are seen on the lipid parameters. Significant improvement in secretion and action of insulin occurs with interventions.

No conflict of interest

0173

FIN-D2D

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Aims: To implement the prevention of type 2 diabetes in primary health care using the Finnish type 2 diabetes risk score (FINDRISC) in identifying high risk individuals for further testing and intensified lifestyle intervention.

Methods: FIN-D2D project was carried out in 2003-2008 as part of the national diabetes prevention programme in the health centers of five hospital districts with the population of 1.5 million. The self-administered FINDRISC was the main screening tool with a score of $\geq$ 15 as cut-off point. High risk individuals were referred for nurse-led intervention programmes based on the experiences from the Finnish DPS-study. Oral glucose tolerance test (OGTT) was performed for detecting undiagnosed diabetes.

Results: Altogether 200 000 persons were screened. A high-risk cohort (n=10 149, 30% men) was collected for evaluation. The number of performed OGTTs increased three-fold on the survey area. Baseline OGTT showed abnormal glucose tolerance in 68.1% of men and 49.4% % of women. 5523 high risk individuals participated in the follow-up. Among them, 45.4% of men and 42.1% of women had at least one intervention visit. 23.7% of men and 28.4% of women had ≥4 intervention visits. During the follow-up of one year the mean weight change was -1.0 kg and waist change was -1.1 cm. If the individual had ≥ 4 intervention visits, weight change was -2.7 kg and waist change was -2.8 cm. After the follow-up of one year, glucose tolerance improved along with lifestyle changes.

Discussion: Screening a large population using FINDRISC is possible in primary health care. Less than half of the individuals at high risk participated in interventions but it was still possible to achieve favourable changes in weight, waist, and glucose tolerance in the whole cohort.

Conclusion: Large-scale screening and effective lifestyle interventions are possible to carry out in a primary health care setting.

No conflict of interest

0174

Diabrisk SL

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Prevalence of Type 2 Diabetes Mellitus and associated cardio-metabolic disease in young adults is rapidly increasing in Asia. Prevalence of risk factors that predispose young persons has not been identified.

Diabrisk SL is being conducted in an urban young (6-40yrs) Sri Lankan population of 22,577 volunteers (10,612M, 11965F)] to determine the presence of risk factors. It involves selecting persons with two or more risk factors of increased Body Mass Index (BMI), increased waist, physical inactivity and 1st degree family history using a simple questionnaire. Participants receive physical and biochemical assessments and advice on lifestyle modification over 2 years. Participants are randomly divided into intensive or non-intensive groups. Aims are to delay or prevent disease endpoints by simple intensive non-pharmacological lifestyle intervention and assess rate of incidence.

Of 22, 577 subjects, 8814 (46%), 4703 (41%) and 9060 (51%) were males in 6-14yr, 15-19yr and 20-40yr age categories respectively. 34.2% of the study population had two or more risk factors, 33.1% had one and 33.6% none. The prevalence of an increased age appropriate BMI was 19.7% and 15.4% in the 6-14yr and 15-19yr categories with no significant difference between males and females. In the 20-40yr category, 28.1% males and 21.9% females had increased BMI ($p<0.001$ M vs F). There was a higher prevalence of increased waist in females than males: 42.9% vs. 32.0% (6-14yrs); 28.2% vs. 16.0% (15-19yrs); 34.4% vs. 25.9% (20-40yrs) [F vs. M $p<0.05$ for all]. In all groups, prevalence of physically inactive females was higher than males: 39.9% vs. 15.0%; 51.6% vs. 19.5%; 63.0% vs. 41.1%. Physical inactivity increased in both sexes with age [$p<0.05$ for F vs. M and with increasing age].

The study reveals the presence of a significantly high prevalence of modifiable cardio-metabolic risk factors at an early age, and non-pharmacological intervention should be instituted early.

No conflict of interest

SYMPOSIUM

FOUNDATION SCIENCE

The role of endoplasmic reticulum stress in diabetes

0175

ER stress and the UPR: from yeast to man

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Eukaryotic cells maintain a balance between the burden of unfolded proteins that enter their endoplasmic reticulum and the capacity of the organelle to cope with this bio-synthetic load. To do so, cells engage signal transduction pathways that respond to deviations from this balance (or ER stress) by altering rates of mRNA translation and gene transcription. These pathways are collectively referred to as the unfolded protein response (UPR) that has features conserved from yeast to mammals.

Evidence accrued in the past 10 years indicates that the UPR is active in beta cells and more so in the overworked beta cells of individuals coping with the consequences of insulin resistance. Furthermore, extreme compromise of UPR components, notably the ER-stress induced kinase PERK and its down stream effector, translation initiation factor 2 alpha, severely compromise beta cell function causing a syndromatic form of diabetes. These findings suggest that beta cells are especially sensitive to the consequences of ER stress and that prolonged ER stress might contribute to a decline in beta cell function in the course of the development of diabetes mellitus.

Here, I will review the workings of the UPR and try to address recent knowledge on the possible role of ER stress and the response to it in the development of diabetes.

No conflict of interest

0176

Lipotoxicity and glucotoxicity as triggers of beta cell ER stress

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Type 2 diabetes results from a reduced ability of the pancreatic beta cells to secrete enough insulin to stimulate glucose utilization by peripheral tissues. This insulin deficiency is probably associated with a progressive reduction in beta cell mass, secondary to chronic exposure to high free fatty acid (FFA) and/or glucose levels (lipo- and glucotoxicity).
The endoplasmic reticulum (ER) is the cellular organelle where export proteins, such as insulin, are produced and folded. Accumulation of misfolded proteins in the ER causes ER stress and activation of the unfolded protein response. This response aims to alleviate ER stress, restore ER function and prevent cell death, but if these protective steps fail apoptosis is triggered.
The large demand on pancreatic beta cells to synthesize, sort and secrete insulin may render them vulnerable to perturbations in ER function. Accumulating evidence suggests that components of the ER stress response play a dual role in beta cells, acting as regulators under physiological conditions, or as triggers of beta cell dysfunction and death under situations of chronic or severe ER stress. ER stress is present in beta cells in human type 2 diabetes, in rodent models of the disease, and is elicited in conditions of gluco- and lipotoxicity. High glucose induces a mild unfolded protein response, while saturated FFAs trigger more severe ER stress in beta cells by depleting ER calcium. This induces pro-apoptotic pathways and eventually beta cell death. Understanding the molecular mechanisms underlying pancreatic beta cell loss will allow the development of targeted approaches for the prevention and treatment of type 2 diabetes.

No conflict of interest

0177

The role for the UPR in beta cell adaptation to physiological demand

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The endoplasmic reticulum (ER) is a cellular compartment specialized for chaperone-assisted folding and post-translational modification of nascent polypeptides. Disruption of ER homeostasis leads to accumulation of unfolded protein and activation of the unfolded protein response (UPR). The UPR emanates from the ER through activation of three transmembrane sensors, IRE1, PERK, and ATF6. IRE1 is a protein kinase / endoribonuclease that, upon activation, initiates a splicing reaction that removes a 26b intron within the ***XBP1*** mRNA. Spliced ***XBP1*** mRNA produces a potent basic leucine zipper (bZiP)-containing transcription factor of the ATF/CREB family that activates UPR gene transcription. Activation of PERK by ER stress leads to inhibition of translation initiation through phosphorylation of eukaryotic initiation factor 2 (eIF2) on the alpha subunit. Paradoxically, there are several mRNAs that require eIF2a phosphorylation for efficient translation, ie. ***ATF4*** mRNA. ATF4 encodes a transcription factor required to activate genes involved in amino acid biosynthesis and transport, anti-oxidative stress responses, and proapoptotic functions, such as CHOP. Finally, ATF6 is an ER transmembrane protein that contains a bZiP domain in the cytosolic domain and a stress-sensing domain in the ER lumen. Upon accumulation of unfolded proteins in the ER lumen, ATF6 transits to the Golgi compartment for cleavage by the proteases S1P and S2P to generate the cytosolic fragment which traffics to the nucleus to activate transcription of a subset of UPR target genes. Recent studies demonstrate that the UPR plays important fundamental roles in the etiology of insulin resistance and type 2 diabetes. Studies will summarize the unique and essential features of the cellular response to ER stress and how ER stress is intimately coupled with oxidative stress and beta cell failure. Glucose-regulated insulin production in pancreatic beta cells requires an intact PERK/eIF2a subpathway to prevent oxidative stress.

No conflict of interest

0178

ER stress and insulin resistance

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The Endoplasmic reticulum (ER) is a luminal organelle where secretory and membrane-bound proteins are folded into their final three-dimensional structures. Several different pathological conditions, such as deficiency of glucose, increased protein synthesis, aggregation of mutant proteins that are incompatible for folding, virus infections, cholesterol accumulation and free fatty acids exposure interfere with proper functioning of ER, create a state defined as ER stress and lead to activation of a signaling network called the unfolded protein response (UPR).
Sedentary life style in the last several decades severely increased the prevalence of obesity, which led to a severe rise in the incidence of insulin resistance and type 2 diabetes. Molecular mechanisms of insulin resistance are not well understood. In recent years we and others have shown that increased endoplasmic reticulum stress in obesity plays a major role in development of insulin resistance. In this context, X-Box Binding protein (XBP1) was identified as a central regulator of metabolic homeostasis; heterozygous deletion of XBP1 in mice created severe insulin resistance even on a background, which is completely resistant to obesity-induced insulin resistance. Additionally, we recently demonstrated that ER stress and XBP1 has a pivotal role in development of leptin resistance in the brain. Reversal of ER stress with chemical chaperones both sensitized the mice to insulin and to the action of leptin in the brain.
In my talk I will mainly discuss how UPR leads to insulin resistance and discuss the mechanisms that XBP1 utilizes to regulate the insulin sensitivity and metabolic homeostasis.

No conflict of interest

TEACHING LECTURE

LIVING WITH DIABETES

Future of type 1 diabetes: does technology hold the key?

0179

Future of type 1 diabetes: does technology hold the key?

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Recent years have seen dramatic advances in the technology of diabetes management with developments in 'designer insulins', insulin delivery systems and methods for glucose monitoring. Nevertheless, these technical developments still require voluntary input from individuals with diabetes to maximise their potential and achieve optimal glycaemic control. The successful development of a truly automated 'closed-loop' system which will operate independent of patient input remains a long-term goal.
Poor adherence with many practical aspects of diabetes management remains a major obstacle to optimising patient outcomes. Psycho-educational interventions have been shown to have a modest benefit on many outcomes including HbA1c. Techniques designed to facilitate behaviour change such as Motivational Interviewing (MI) have been shown to be beneficial in both teenagers and young adults with diabetes. However, in many clinical services there are shortages of psychologists appropriately trained in techniques such as MI, and the challenge remains to integrate the principles which underlie these methods into routine consultations by all clinical staff. Given the success of MI, the DEPICTED trial has taken some of its key concepts and produced a training package for use by health-care professionals in routine clinic consultations. This intervention is now being tested in the UK across 26 clinics with outcomes to be measured in 697 children and teenagers with diabetes.
Until the arrival of a truly independent, automated 'closed-loop' system, it is likely that optimal outcomes for patients will only be achieved with support from clinicians who have expertise in skilled behaviour change talk. This counselling

style will need to stimulate and support patients to resolve uncertainties in their own minds about making changes to their diabetes management, regardless of the sophistication of the technology involved.

Conflict of interest:
Advisory board: Gregory - Bayer
Other substantive relationships: Gregory - Member of Novo Nordisk UK Research Foundation Research Selection Committee.

WORKSHOP

Alternative medicine: its role and practice

0180

Alternative medicines and diabetes control: the Jamaican experience

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Over the past 3 decades, medico-social studies indicate that a significantly high number of patients come to the evidence-based medical centres only after extensive consultations with their peers and local healers.
A survey in the Diabetes Outpatient clinic at the University Hospital of the West Indies, in Kingston, Jamaica, 1979, revealed that irrespective of the socio-economic strata or level of education attained, some 85% of patients attending the clinic had consulted with the local healers and were taking their alternative medications either instead of, alongside or intermittently with the formal prescriptions.
A Jamaican study by Hugh Jones in 1955, reported that patients were using a variety of 'bush teas' in the treatment of their diabetes. The common outcomes were that glycosuria disappeared as well as the patients seemed to tolerate high levels of glycaemia with less than 2+ ketonuria and little apparent diabetes-related morbidity. It was hypothesised at the time that these 'bush teas' were causing elevated renal thresholds, resulting in aglycosuria and patients believing that they were cured. This clinical picture initially dubbed J-type diabetes, was later called Phasic Insulin Dependence Diabetes mellitus (1981,1995) as a result of further clinical patterns elaborated by Morrison et al.
A detailed study by Morrison et al 1982, of a variety of 'bush teas' on the blood sugar levels in dogs, did reveal reliable and reproducible effects on blood sugar levels. However, in some cases, the sugar levels were elevated with histological damage to liver, pancreas and kidney cortex.
Jamaica is an active participant in the multi-billion dollar trade involving food supplements, natural products and neutraceutics.
There is urgent need for study to be able to offer sound evidence-based advice as to the value of alternative medicines, the use of which is a culturally ingrained behaviour.

No conflict of interest

0181

Herbal medicine

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Prevention and cure of diseases through natural intervention is, on principle, an attractive method of medical practice. The wide-spread use of plant materials against many diseases throughout human history is an example of such natural intervention. In modern medicine increasing emphasis is given to pure compounds. However, in practice, it also uses combination of drugs or compounds. Plants are store house of compounds and effective therapeutic agent may be developed by isolating, characterizing and manipulating the individual compounds from plants as well as by studying certain extracts or fractions of plants using. In both the cases multidisciplinary research, with application of highly sophisticated technology in certain cases, is a must. Study of cruder plant materials may also relatively be difficult due to variability of potency in respect to age, geographical location and season of collection of the plant. Also no standardized toxicological methods are available for such studies. More and more effort will be necessary in this regard with flexibility for individualized approach keeping scientific transparency. For edible plants human experience, under proper scientific design and monitoring, should be given due importance since many diseases do not have exact animal models. Moreover, ethical aspects of animal research have also to be taken in consideration. The central issue in plant material research is to maintain a scientific outlook. It is important to understand that the great names in this field were highly gifted scientists of their respective ages, but they were, after all, human beings. Thus one should not make them deities and should not turn science into faith.
With the above approach we have been conducting collaborative research on antidiabetic plants with a number institutes. The results indicate that plants may serve as a good source of antidiabetic compounds. Our experience suggests that the effects of various plants materials may be mediated by various mechanism which potentially combat specific pathophysiological events in both type 1 and type 2 DM. Studies with some plant fractions on insulin secretion from isolated rat islets, calcium mobilization in single B-cells, inhibition of carbohydrate absorption through gastrointestinal tract (GI) in rats by inhibiting disaccharidase activities, effects on GI motility and inhibition of platelet aggregation indicate the presence of various principle(s) in hypoglycemic plant extracts.
Our studies have also shown the best time to use the plant materials in relation to meals. This information is of practical importance because plant materials continue to be widely used especially in rural areas of many developing countries.

No conflict of interest

0182

Meditation

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Mind is the fast track processor of all sensory inputs past and present and the creator of all thoughts, words and deeds. It is a non material functional unit attached to the brain.
Body is the physical component of the human being created by the genetic code and its interaction with its environment. It responds to the thoughts words and deeds produced by the mind.
Stress is a neuro-endocrine response to a threat to physical health, mental well-being and the survival of an individual from conception to death**.** Psychosocial stress is an important aetiological factor in the development of T2DM. Modern lifestyle often increases the level of stress due to failure of achievement. The individual stress response increases hormone levels leading to elevated blood sugar and blood pressure.
Meditation is an art by which the mind can be calmed so that status quo is re established and wide fluctuations of emotion is minimized with the development of happiness and the elimination of sadness by accepting a the knowledge of impermanence.
This is often achieved by concentrating one's mind on single object for a period of time so that calmness of mind would prevail and a state of constant change (impermanence) perceived with acceptance of failure as part of the process. In effect, it detoxifies the human mind using the inner strength which is built into the system to weather the changes of stress without pharmacological intervention. The process of mastering meditation is slow but with persistence, it could be achieved by anyone without religious or ethnic bias.
It would be evident that the mind body interaction is critical for the prevention of T2DM especially in the modern world.

No conflict of interest

0183

Yoga

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Yoga originated from India around 1900 BC as a tradition to explain or study the human mind and physical conditions, and was disseminated to the West about 150 years ago. The essential components encompass philosophical, psychological and physical elements. Characteristics of the latter consist of breathing techniques and a variety of postures. There are similarities between the yoga state and the practice of mindfulness. The outcomes arising from the practice of yoga include optimism and better health outcomes; effective handling of anger and reduction in sympathetic nervous system arousal. Impact on physical health may be mediated via the hypothalamic-pituitary-adrenal axis. Breathing techniques result in increased oxygen consumption with the

minimum of physical exertion, while the different postures exercise all muscles of the body.
The practice of yoga may be relevant to diabetes through the effective adoption of a healthier lifestyle, positive affect, and reduction in chronic sympathetic nervous system arousal which predisposes to the metabolic syndrome. Currently some evidence support this effect, although the quantity is sparse and studies are largely of short duration, with small sample size and lacking in control groups. Some evidence relating to the beneficial effect of techniques with similarity to the practice of yoga (mindfulness; qigong) and diabetes is also available. The practice of yoga may be beneficial for the diabetic state through promotion of a healthier lifestyle through psychological and physical pathways. However more randomized controlled trials are needed to establish a firm evidence base.

No conflict of interest

SYMPOSIUM

ASSOCIATION DEVELOPMENT

Diabetes care to the people: what is the role of IDF Guidelines?

0184

Clinical guidelines: do they make a real difference?

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The International Diabetes Federation is an international body which represents countries from both developed world as well as third world nations and also the rapidly developing economies of Asia and South America. It represents patients as well as care givers and professionals. It also works closely with the WHO. Thus any guideline from the IDF, especially the Global Guideline For Diabetes Care which seek views and contributions from many countries, and have grades of care depending on resources, are easier to accept locally and are used as a clout to press for improvement in diabetes care. Significant changes and improvements were made in many countries; eg increase in funding for diabetes care, setting up of diabetes centers, more manpower trained in the care of diabetes such as nurse educators and dietitians, and more research funding, eg Singapore and Malaysia have been doing national surveys every 10 years to determine prevalence of diabetes and IGT, obesity, etc.. Governments are more aware of the increasing burden and the need for intervention programs from the guidelines. Thus at national level, these guidelines made a difference. Similarly the Asia Pacific Guidelines made countries in the region change the criteria for overweight and obesity from BMI of 25 to 23, and 30 to 27 respectively. Similar changes were made to waist circumferences. At the practitioner level, there are many guidelines available…national, ADA, EASD, IDF etc. Targets for diabetes care are almost similar. Limitations in terms of financial coverage for care, lack of professional help eg podiatrists, makes it difficult to achieve targets. Several studies clearly showed the difficulty to achieve guideline targets. Our own studies and others published will be presented. The real difference these clinical guidelines make however is that patients and practitioners are more aware of need for and striving to achieve better care.

No conflict of interest

0185

Clinical guidelines: does one size fit all?

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Yes: the disease is the same all over the world
No: local conditions vary widely, also the way of life for patients. Limited resources
Cost: two options (1) Voluntary work eg IDF (2) Full pay professionals ex Canada; UK ea
Steps in the process of writing guidelines: a long journey
Documentation: finding and evaluating the sources, a long and time consuming task. Collected and evaluated according to strict protocols Best EBM retained as references
In countries with limited budget: Make contact with other countries in same language area and ask permission to use their reference work
Define target and adapt to it
Optimum care: for tertiary university hospitals
Standard: for city hospitals secondary care
Minimal: for health centres primary care
For patients and families
Writing draft: A team with limited number of persons, good internet communication, experience in editorial tasks
Advice fro (1) scientific (2) public health for practical feasibility
Presentation: For the three levels separately
Printed version, electronic (word and PDF) Quick reference sheets
Patient education: usually with many clear illustrations
Printing and distributing Difficult in developing countries
Implementing and keeping up to date
Workshops with the team who wrote the guidelines. A slow process needs repetition to change behaviour. Find and train resource persons "champions" for teaching the teachers sessions
Evaluating

No conflict of interest

0186

Modifying clinical guidelines based on ground realities

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Aim of guidelines is to provide useful and accurate information regarding a health topic in order to facilitate the work of the health care provider. Cultural, economical, ethnical factors, among others, make health care reality around the world different. In diabetes care, guidelines should consider many aspects regarding diabetes itself and its complications. Therefore, to make a global guideline which is useful all over the world is not easy. Current IDF guidelines have considered many of these aspects giving general information. But, if you try to use the guideline in your daily practice, the help you get is also very general. How can they be improved considering on ground realities? Three key steps should be taken: First, to know whom the guideline is directed to and what this group expects of it. IDF guidelines intend to provide information mainly to general practitioners in countries and regions that have no guidelines of their own, therefore simple, short and concrete information is essential. Second, to provide concrete information, avoiding referring the reader to other sources to get it. Current guidelines refer the reader to other sources in all clinical topics, this is a barrier to use them and make other guidelines more useful. And third, try to summarize the most important topics with relevant information that can be used all around the world. Differences among health care systems and conditions create an artificial differentiation in Diabetes care, dividing it in minimal, standard and comprehensive care where minimal is the poorest and worst way to treat diabetes and comprehensive the best and more expensive, this is also justifying bad care confusing primary health care with primitive one. It can be possible to implement guidelines that include standard care with alternatives when there is lack of resources.

No conflict of interest

0187

Matching clinical guidelines; from ivory towers of academia to ground realities?

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The epidemic of cardiometabolic diseases was driven largely by hypercholesterolaemia, hypertension and smoking. Despite important advances in reduction of these risk factors, disturbing increase in the worldwide prevalence of abdominal obesity appears as a new challenge.
While current management of people with Metabolic Syndrome (MS) is appropriated directed towards the correction of the individual abnormalities, however, it may be much more effective to tackle the problem at its source with programs directed towards the prevention and reversal of abdominal obesity.
Strong evidence supports the use of diet and exercise to prevent or delay the onset of T2DM in people with MS/prediabetes. A wide range of initiatives are now underway to move evidence-based diabetes prevention to a community setting, into the public sector.

In middle income countries as in rich countries the burden of MS is growing in direct relation to the pandemic of obesity and T2DM.
Increasingly, within countries diseases follow the social gradient: the lower the status the higher the risk. Worldwide, obesity is seen to be more prevalent in those of lower status than of higher.
International health organizations and governments must address the social determinants of health, translational research into the community setting and make policies to reduce health inequalities within and between countries.

No conflict of interest

TEACHING LECTURE

EDUCATION

Socratic dialogue: patient empowerment

0188

Socratic dialogue: patient empowerment

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Socratic dialogue, when used in a small group setting, is a process, guided by a facilitator, designed to address a general question relevant to that group. In this session the question is "What is patient empowerment?" The session faculty will explore this question by examining several practical situations, with the aim of helping the audience understand how to facilitate patient empowerment, and how to monitor whether using the empowerment approach to diabetes care and education leads to improvements in patients' quality of life and/or glycemic control.
Some of the practical situations the group might examine in an effort to explore the meaning of patient empowerment include: 1) first meeting between a new patient and a clinician or diabetes educator, 2) patient in the transition between adolescence and young adulthood, when diabetes care might not be a priority, 3) depressed patient, 4) patient living in a part of the world where many people, particularly women, are anything but empowered, 5) health care provider who wants to facilitate empowerment but is unclear how to do this.
The audience will have an opportunity to explore their own ideas about patient empowerment as the group engages in their Socratic dialogue. The goal of this process is to clarify the meaning of patient empowerment and to help the audience find ways to make their work with patients more effective and more satisfying.

No conflict of interest

SYMPOSIUM

HEALTHCARE AND EPIDEMIOLOGY

Populations at risk: understanding why

0189

Indigenous populations

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Indigenous populations around the world are currently undergoing a seismic epidemiological transition, with dramatic increases over the last several decades in a number of chronic health conditions, including overweight, cardiovascular disease and (especially) type 2 diabetes mellitus. While the cultures, histories, local environments and other characteristics of these indigenous populations vary across a wide spectrum, several commonalities are shared among these groups with respect to diabetes. These common features include a prevalence of diabetes that is often several times in excess of the surrounding general (non-indigenous) population of the region; a pronounced leftward shift in age of onset, resulting in a high prevalence of childhood- and youth-onset type 2 diabetes; and a heavy burden of micro- and macrovascular complications, again frequently with an accelerated time course of occurrence. Although it has been demonstrated that Indigenous populations are impacted by many of the well-established risk factors for diabetes (including unhealthy body weight and suboptimal diet and physical activity), a number of distinctive factors may also be at play in these populations, including specific genetic variants and more difficult to quantify factors such as poverty, social and economic marginalization, cultural disruption and loss of traditional lifestyles.
This ominous chronic disease profile among Indigenous populations around the globe highlights an urgent need for effective, culturally appropriate primary and secondary prevention strategies. In this context, a number of successful, long-standing clinical and community-based intervention programs will be discussed.

No conflict of interest

0190

New immigrants

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An atypical form of type 2 diabetes revealed by ketosis or ketoacidosis (Ketosis-prone type 2 diabetes, KPD) has emerged as one of the most frequent in populations of African descent. It is characterized by an acute onset with severe hyperglycemia and ketosis or ketoacidosis, followed by long-term insulin-free near-normoglycemic remission periods, frequently interrupted by ketotic relapses but without islet-cell autoantibodies. Our studies benefited from the north-east location of Saint-Louis Hospital in Paris, where lives an important community of migrants from sub-Saharan Africa. We observed that 40% of the diabetic subjects of African origin attending our department displayed such a phenotype. At onset, insulin secretion in response to glucose was drastically reduced, but the subsequent remission was associated with a restoration of insulin secretion in most patients. In the context of near-normoglycemic remission, we observed insulin resistance at the level of muscle, adipose tissue and liver as demonstrated in type 2 diabetes. Because of the acute onset of KPD and the high prevalence of this phenotype of diabetes in Africans, we searched for a virus that is commonly found in this population. Human herpes virus type 8 (HHV-8) or Kaposi syndrome associated herpes virus (KSHV) is endemic in sub-Saharan Africa where most individuals get infected during childhood so that around 45% of adults have markers of HHV-8 infection, without necessarily having clinical manifestations. We found a high frequency of HHV-8 seropositivity and viral DNA in the majority of patients with KPD when compared to patients of the same origin but with classical type 2 diabetes or to matched healthy controls. In addition, we showed that the virus is able to infect human islet beta cells ***in vitro,*** therefore providing additional evidence that it could be associated to the acute phase syndrome in these subjects otherwise predisposed to type 2 diabetes.

No conflict of interest

0191

Lessons learnt from the East Asian population

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In this pandemic of diabetes affecting 170 million people, 60% will come from Asia with India and China as the 2 most affected countries. Latest figures suggest than 10% of Chinese have diabetes with the most rapid increase in young adults, middle aged men and people with low educational levels. Smoking, family history and obesity are other major risk factors. As in most countries, the majority of diabetic patients are undiagnosed, untreated or managed suboptimally resulting in late presentation and multiple comorbidities. Asians have reduced beta cell function which can be unmasked by small increase in adiposity to cause diabetes. Despite their low BMI, many Asians have increased visceral fat and fatty liver which predict diabetes and cardiovascular disease. Apart from rapid urbanization and lifestyles changes, environmental (e.g. low grade infections and pollutants) and genetic variants are other contributing factors. The high prevalence of low birth weight in some developing areas, gestational diabetes and childhood obesity continue to fuel the epidemic through 'diabetes begetting diabetes'.

Due to the young age of onset and thus long disease duration, Asian diabetic patients are at high risk for cardio-renal complications with cancer emerging as an important cause of death. Despite these health care challenges, there have been exemplary examples of diabetes prevention and care programs in Asia. These include the benefits of lifestyle modification on reducing diabetes risk; use of intensive insulin therapy to cause diabetes remission and use of multifactorial care to reduce risk of cardio-renal complications. The challenge lies in translating this evidence into practice to reduce the burden of these chronic diseases. Here, a population-based strategy and a multidisciplinary care model augmented by government policies and clinical governance are needed to raise awareness, detect disease early and improve quality of care.

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No conflict of interest

0192

Factors giving rise to risk in Africa

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Africa is experiencing one of the most rapid demographic and epidemiological transitions of the world's history, with the emergence of diseases of aging, notably non-communicable diseases such as diabetes. The burden of diabetes varies widely in Africa and African diasporas. There is an increase over time that parallels the socio-economic development. Diabetes is still rare in traditional rural communities in Africa (1% to 3%), with a rural-urban gradient in increasing prevalence. In addition to cross sectional urban-rural differences, it was demonstrated that the duration and chronology of exposure to an urban environment influences the risk. Recent rural-urban migration and lifetime migration history are stronger predictors. Changes in diet were incriminated, but available data remain insufficient to fully support this hypothesis. There is increasing measurable evidence on the contribution of physical activity changes to the risk of diabetes. Reduction of commuting physical activity may be the most important predictor. The reduction of walking does not affect only developed countries, but is also a hallmark of urbanization and westernization in Africa. In fact, walking is the main transportation means in rural Africa and is declining with economic development. We observed a large reduction in walking time and pace in an urban community in sub-Saharan Africa, as compared with a rural sub-Saharan African community (a reduction by a factor of 2 to 4 for walking at a slow pace and by a factor of 6 to more than 10 for walking at a brisk pace). This decreased use of daily walking is associated with cardiometabolic risk and deserves similar attention as in developed countries. Intervention studies are still limited in Africa. The authors will discuss available evidence on the risk of diabetes and its determinants, and the implications for prevention of diabetes in Africa.

No conflict of interest

OPEN FORUM

ASSOCIATION DEVELOPMENT

Diabetes: invest in prevention or early diagnosis ?

0193

Diagnosing unrecognized diabetes is more important than prevention

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While the ravages of HIV/Aids grab headlines and the outbreak of swine fever whips people into hysteria, beaming breaking news items on all major television networks, it is diabetes, the silent killer, which is counting the costs of deaths worldwide. Outbreaks, like swine fever, are categorized by their seriousness and the effects it has on humanity worldwide, almost like the onslaught of hurricanes. It is diabetes which is defined by either type 1 or type 2 and not by the fact that it is an epidemic and many succumb to its complications annually. The treatment of diseases like HIV/Aids has a high priority worldwide and many high profile personalities with their red ribbons emblazoned on their attire expose and create awareness to the rest of the world. People who are involved in diabetes campaigns and education are aware of the devastation that this condition brings to people in the world. This raises the question: Is diagnosing unrecognized diabetes more important than prevention? Bearing in mind that prevention is an outcome.

My answer would certainly be yes and in this paper the following points will be interrogated.

- Throughout the world awareness campaigns particularly during world diabetes day highlights the seriousness of diabetes and this should not happen only during this period but all year round.
- Developing partnerships is a prerequisite to ensure the success of these campaigns.
- Early diagnosis reduces/minimizes complications whether it is acute or chronic.
- Involve the health departments and the private institutions in all programs and vice versa.
- Set up support groups at all clinics, hospitals, business, community and the various state departments (business and state institutions have wellness days).
- Complementary medicine has got to be involved.
- Champions need to be identified in families and all the stakeholders to ensure optimum awareness takes place.
- Education is a key component in this setup so that all areas are covered e.g. knowledge of the condition, medication, diet and exercise.
- The challenge today especially in developing countries is poverty which is connected to the price of medication and the cost of living.
- We find that more and more people are being urbanized and this phenomena brings about its own problems e.g. accommodation, running water and sanitation.
- Most of our health care givers are obese and some are unaware that they have hypertension and diabetes and this sets a bad example to their clients.

No conflict of interest

0194

Should we concentrate on prevention when so many of our preople have undiagnosed diabetes?

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Persons with diabetes are rising globally in step with the ongoing increase in obesity levels worldwide. There is no cure and has serious and life-threatening complications. By the rule of halves among persons with diabetes 50% are diagnosed, for those diagnosed 50% receive care and 50% reach their targets, 50% achieve desired outcome and only 6% would have a successful outcome. In Ghana, 7 out of 10 cases diagnosed did not know that they had diabetes, the prevalence for impaired glucose tolerance is 12.4% and the trend has

increased 16 fold since independence. Screening of undiagnosed diabetes through primary prevention of diabetes is very important within the population especially the at-risk groups, the vulnerable and in communities. Resources are scarce to handle the ever increasing rise. Access to health care service is a barrier especially for diabetes mellitus in Africa. The reasons are poverty and under-nutrition. Primary prevention is a first step before diagnosis which can be done at the point-of-care in most health facilities in developing countries. However, for the undiagnosed person with diabetes, chronic complications will have already started and or developed for which secondary and tertiary level preventions are the appropriate approaches in managing the condition. The burden of managing undiagnosed diabetes is on person but prevention is at the society. Lack of proper diabetes education, language, poor eating & living a sedentary life are not recognized as a serious problem. The cost-effective means is primary prevention but diagnosis of undiagnosed must be part of program to prevent the onset of chronic complications which is costlier. The at-risk-persons must be targeted through primary prevention. If nothing is done, it will threaten the gains of the economic growth in most countries in Africa. Today we are driving the fight against diabetes in the dark.

No conflict of interest

SPEAKERS' CORNER

IDF and the associations; but what of the individual with diabetes?

0195

IDF and the associations; but what of the individual with diabetes?

W.H.J.M. Wientjens[1]

Of course, "we all" know that someone diagnosed with diabetes needs medical treatment. In this process of medical treatment, a person with diabetes is just a patient, dependent on his/her own health care system. However, medical treatment is by far not enough for an individual with diabetes. There are also two other very important processes, i.e. the process of education and the process of being a full member of society.

Education does mean that someone with diabetes is learning how to live with his condition of diabetes. As an individual during his journey to good self management. Sometimes alone, sometimes together with others. With family, friends, colleagues. And learn to live with hypo's, hypers, depressions. To live with the threat of complications. Twenty four hours a day. You are not a patient then. You are in this process of education a pupil and hopefully to become a master of your diabetes condition.

And thirdly. Also an individual with diabetes wants to be a full member of society, with all the rights, duties and responsibilities of every human being. Without prejudices, without discrimination. It is so unfair that people are discriminated just because of a label with the text "diabetes" on their forehead. These three above mentioned processes are for me fully equivalent to one another.

By lack of time of the health care professionals, diabetes associations must recognize 'peer support' as a promising approach to diabetes management. People with diabetes and those affected by the condition are able to help other people with diabetes and their family to cope effectively with a range of demands and challenges involved in diabetes management, and in their struggle against discrimination. For the benefit of each individual. So, think globally and act locally.

No conflict of interest

ORAL PRESENTATION

CLINICAL RESEARCH

Complications - predicton of mortalty and cardiovascular events

O-0196

Healthy lifestyle behaviors and risk of mortality among adults with and without diabetes in the U.S.

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Aim: Few studies have quantified healthy lifestyle behaviors' impact on longevity of the diabetic population. We examined the association between healthy behaviors and all-cause mortality among adults with and without diagnosed diabetes (DM).

Methods: We used data from the Third National Health and Nutrition Examination Survey, a nationally representative survey of non-institutionalized U.S. residents, conducted from 1988-1994 with follow-up for mortality status through 2001 (follow-up mean 8.4 years, maximum 13 years). Diabetes status was self-reported (n with diabetes = 1177, n without diabetes = 15217). We examined 5 self-reported healthy behaviors at baseline: physical activity>= 6 MET per week, not smoking, higher healthy eating index (HEI), moderate alcohol consumption (1-2 drinks/week), and maintaining weight or trying to lose weight in the past 12 months. We used proportional hazards models to determine the impact of a composite estimate of healthy behaviors, as well as each healthy behavior, with all-cause mortality, after adjusting for age, sex, race/ethnicity, education, body mass index (BMI), self-reported health status and heart attack history.

Results: All-cause mortality rate was significantly higher among adults with DM (43.7 per 1000 person years) than adults without DM (9.4 per 1000 person years). A higher summary score of healthy behaviors was associated with lower risk of all-cause mortality among both adults with DM (Relative Hazard (RH) 0.85, 95% Confidence Interval (CI) 0.80, 0.91) and without DM (RH 0.83, 95% CI 0.79, 0.86) after controlling for demographics, BMI, self-reported health status and heart attack history. People in the top 20% of healthy behaviors summary score had an adjusted 58% lower mortality rate than those in the bottom 40%. In models with individual healthy behaviors, persons with and without DM who reported physical activity >= 6 MET per week had a significantly lower mortality rate than those reporting low or sedentary levels [with DM: RH 0.50 (95% CI 0.33, 0.75); without DM: RH 0.65 (95% CI 0.51, 0.82)]. Moderate alcohol consumption was associated with decreased mortality (RH 0.46, 95%CI 0.23, 0.93) among persons with DM but not among those without DM. Among adults without DM, current smoking was associated with increased mortality (RH 1.81,95% CI 1.47, 2.21) compared to not smoking; higher HEI was associated with lower mortality (RH 0.76, 95% CI 0.65, 0.90) compared to lower HEI.

Conclusions: Our findings underscore the central role healthy lifestyle behaviors play in preventing premature mortality among people with and witout diabetes. Promoting and sustaining such behaviors should continue to be a priority for public health interventions.

No conflict of interest

O-0197

Rs2383206 and its association with mortality in a cohort of individuals with type 1 diabetes

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Aims: Single nucleotide polymorphism rs2383206 on 9p21 gene has been previously associated with coronary artery disease (CAD) in the general population and individuals with type 2 diabetes. We thus assessed the relationship between this polymorphism and CAD and mortality in the Pittsburgh Epidemiology of Diabetes Complications (EDC) study of childhood onset type 1 diabetes.

Methods: EDC participants with DNA available (baseline mean age 27 and duration 19 years) were studied for the incidence of CAD or mortality (n=482). CAD was defined as EDC-physician diagnosed angina, ischemic changes by electrocardiogram, stenosis ≥50%, revascularization, confirmed myocardial infarction, or CAD death.
Results: The proportions of the cohort with the rs2383206 AA, AG, and GG genotypes were 26.6%, 45.5%, and 27.9% respectively. During 18 years, there were 132 (29.4%) incident cases of CAD and 81 (16.8%) individuals died. Univariately, the proportion of CAD events was lower in those with the GG compared to those with the AA/AG genotypes (21.9 vs. 31.9, p=0.04) although no differences were observed for mortality (p=0.89). This inverse relationship with CAD persisted in multivariable Cox models (HR=0.65, 95% CI=0.42-1.02), whereas a non-significant increased risk was seen for mortality (HR=1.45, 95% CI=0.83-2.53). To eliminate survival bias we repeated analyses by baseline diabetes duration (cutoff 25 years) and diagnosis year (cutoff 1962). Results were not altered for CAD but, surprisingly, a non-significant inverse association for GG vs. AA/AG was now observed for mortality in those with a duration ≥25 years (HR=0.87, 95% CI=0.32-2.36). However, an increased risk was still observed for GG in those with <25 years duration (HR= 1.87, 95% CI=0.94-3.70, p=0.07). Similar trends were observed for analyses by diagnosis year, suggesting that the GG genotype may truly confer susceptibility to early mortality, appearing protective in longer duration individuals. Indeed, the GG genotype was present with a higher frequency in those with <25 years diabetes duration (26.9% vs. 20.9%, p=0.18) or those diagnosed after 1962 (27.7 vs. 20.0, p=0.06).
Conclusion: These findings suggest that the GG genotype of the rs2383206 polymorphism may increase early mortality risk in type 1 diabetes.

No conflict of interest

O-0198

Predictive accuracy of the Framingham and UKPDS risk equations in estimating the probability of cardiovascular events in a multi-national contemporary population with diabetes

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Aims: The reliability of available general and diabetes-specific equations for predicting the risk of CVD in people with diabetes has been questioned. The aim of this study was to validate the Framingham and United Kingdom Prospective Diabetes Study (UKPDS) risk equations prospectively in a multi-national contemporary population of individuals with type 2 diabetes.
Methods: The 4-year risks of total cardiovascular disease (CVD), and its constituents, were estimated using two published Framingham and the UKPDS risk equations in 7502 individuals with type 2 diabetes without known CVD at baseline who participated in the Action in Diabetes and Vascular disease: preterax and diamicron-MR controlled evaluation (ADVANCE) trial. Risk equations were assessed for their discriminatory capability using the area under the receiver operator characteristic curve (AUC) and calibration within fifths of predicted probability using the Hosmer and Lemeshow statistics (HL).
Results: The risk of major CVD was overestimated by 170% (95% confidence interval: 146-195%) and 202% (176-231%), using the two Framingham equations. The risk of major coronary heart disease was overestimated by 198% (162-238%) with UKPDS and by 146% (117-179%) and 289% (243-341%) with the two different Framingham equations. The AUC ranged from 0.62 to 0.69, being significantly better with UKPDS compared with either Framingham equation (all p ≤0.02 for the differences in discrimination). The risk of major cerebrovascular events was overestimated with the UKPDS and one Framingham equation. For all equations and all outcomes examined, there was a significant lack of fit within categories of predicted probabilities.
Conclusions: Application of the Framingham and UKPDS equations to a contemporary treated population with diabetes is likely to substantially overestimate coronary and total cardiovascular risk. New or adjusted cardiovascular risk prediction tools are needed to provide reliable prognostic information to patients and their care providers, and to guide decisions on the intensity of cardiovascular risk reducing therapies in people with diabetes.

No conflict of interest

O-0199

Derivation of the ADVANCE models for predicting the risk of major cardiovascular disease in people with diabetes

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Aims: There is a continuing need to develop risk prediction tools that will reliably estimate cardiovascular disease risk in various settings. The purpose of this study was to derive new equations for predicting the risk of cardiovascular (CV) events in a contemporary population with type 2 diabetes mellitus.
Methods: Follow-up of the Action in Diabetes and Vascular disease: preterax and diamicron-MR controlled evaluation trial (ADVANCE) cohort was used to estimate coefficients for significant predictors of CV events using Cox models in participants without previous CV event. Similar models were used to fit the 4 years risk of incident CV events. Discrimination and calibration were assessed using the area under the receiver operator characteristic curve (AUC) and Hosmer and Lemeshow statistics respectively. Internal validation used bootstrap methods.
Results: A total of 473 major CV events were recorded during follow-up. Age at diagnosis, known duration of diabetes, sex, pulse pressure, treated hypertension, atrial fibrillation, retinopathy, HbA1c, albumin/creatinine ratio and non-HDL cholesterol at baseline were significant predictors of CV events (multivariable-adjusted p≤0.022). A main risk equation was developed using these predictors, and an alternative model used baseline glucose instead of HbA1c. Models displayed acceptable discrimination (AUC: 0.691 to 0.697) and good calibration (p≥0.13). Based on a cut-off for 4-year predicted risk of 8% and above (equivalent to 10-year predicted risk of 20% and above), the two models reliably identified the 21% of participants in whom 46% of all major CVD were recorded during follow-up.
Conclusions: Many current tools used for estimating cardiovascular risk in patients with diabetes have been demonstrated to be unreliable. We describe a new risk engine, developed in a multi-ethnic cohort of diabetics receiving high levels of contemporary preventative cardiovascular therapies. External validation is needed to demonstrate its potential for widespread clinical use.

No conflict of interest

O-0200

Framingham and UKPDS risk engines are not universal predictors of coronary heart disease in type 2 diabetes mellitus

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Aim: To assess the incidence of Coronary Heart Disease (CHD) in patients with type 2 diabetes mellitus (T2DM) and its relation to various risk factors, as well as to assess the predictive value of Framingham and UKPDS risk engines in a Greek population of patients with T2DM.
Methods: We followed 941 consecutive patients with T2DM, who were examined for the first time at the outpatient clinic. At the 5th year of follow-up complete data was available for 886 of them (94.2%). At baseline 658 of the patients (47.6% men) did not have macroangiopathy and were included in the present analysis. The mean age was 58.3 years and median diabetes duration 5 years. Hypertension was present in 45.6%, dyslipidemia in 41.0%, while 47.9% of the patients were current or ex-smokers. CHD was diagnosed according to UKPDS criteria, based on ECG findings, myocardial infarction, coronary angioplasty or grafting or CHD mortality. HbA1c was measured at least 15 times during the 5 years of follow-up and lipid levels at least 5 times.
Results: The 5-year incidence of CHD was 6.8%, much lower than the predicted for this population by Framingham (10.01%, p<0.05) and UKPDS (9.99%, p<0.05) risk calculators. The above risk engines did not differ between them in risk prediction. At baseline, patients who later developed CHD did not differ in sex, age, diabetes duration, BMI, blood pressure, lipid levels, HbA1c, hypertension and dyslipidemia prevalences and smoking habits from those who did not develop CHD. During follow-up, patients without CHD showed significant improvement from baseline in HbA1c (7,5vs7,1%), in lipid levels (Cholesterol 225vs214mg%, Triglycerides 161vs149mg%, LDL 149vs138 mg%) and creatinine (1,03vs0,97 mg%), p<0,01 for all. Patients who developed CHD showed improvement only in triglyceride levels (212vs144 mg%).

Conclusions: a) The 5-year incidence of CHD in Greek patients with T2DM is significantly lower than that predicted by Framingham and UKPDS risk engines, meaning that these engines should be used with caution in the Greek and possibly other populations b) These engines provide similar prediction of CHD in T2DM c) In spite of the short duration of follow-up, metabolic control improvement (HbA1c, lipid levels) may possibly decrease CHD incidence.

No conflict of interest

O-0201

Changes in all-cause mortality in three Finnish middle-aged population cohorts with and without diabetes

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Aim: To assess changes in all-cause mortality rates among people with and without diabetes between three large study cohorts with baseline assessment 10 years apart and followed-up for 10 years.
Methods: Six population surveys were carried out in 1972, 1977, 1982, 1987, 1992 and 1997 in randomly selected independent cohorts in North Karelia and Kuopio, Eastern Finland. For the analysis the 1972 and 1977 (cohort 1), the 1982 and 1987 cohorts (cohort 2) and the 1992 and 1997 cohorts (cohort 3) were combined and followed-up for 10 years regarding all-cause mortality. The people developing inident diabetes during the follow-up or having diabetes at baseline were derived from the national drug reimbursement records of the Social Insurance Institution and the hospital admission records of the National Hospital Discharge Register by computer-based record linkage.
Results: A total of 17 361 men and 18 707 women were followed-up for 10 years. The risk of all-cause mortality decreased in cohort 3 compared to the first two cohorts in both men and women who did not develop type 2 diabetes during the follow-up. In men with diabetes all-cause mortality did not significantly change during the follow-up. The Hazard Ratio (HR) for all-cause mortality after adjustment for age, education, smoking, systolic blood pressure, BMI and serum cholesterol was 0.84 in cohort 2 (95% CI 0.51-1.38) and 0.57 in cohort 3 (95% CI 0.28-1.18). NO statistically significant changes regarding all-cause mortality were observed in women in cohort 2 (HR 1.54; 95% CI 0.96-2.49) or cohort 3 (HR 0.59; 95% CI 0.23-1.49) compared to the reference category (cohort 1).
Discussion/conclusion: While all-cause mortality seems to decrease in the non-diabetic segment of the population, no changes have been observed in people with diabetes. Special attention should be given to prevent the onset of diabetes in the population and to intensify the management of patients with diabetes.

No conflict of interest

O-0202

Serum total adiponectin, cardiovascular disease and all-cause mortality in type 2 diabetes: the Fremantle Diabetes Study

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Aim: To assess the relationship between total serum adiponectin concentrations and cardiovascular disease (CVD), CVD death and all-cause death in patients with type 2 diabetes.
Methods: Baseline data (1993-1996) from 1,158 type 2 diabetes patients from the Fremantle Diabetes Study (FDS), a representative community-based, Australian cohort, were analysed. The FDS database was linked with the Western Australian mortality register between 1 January 1993 and 30 June 2007 to identify deaths and causes of death during 11,927 patient-years (mean±SD 10.3±3.9 years) of follow-up. CVD at study entry was defined as a history of coronary heart disease, cerebrovascular disease and/or peripheral arterial disease. CVD death was defined as death from cardiac or cerebrovascular causes, death from peripheral arterial disease, or sudden death. Multiple logistic and Cox regression analyses, stratified by sex, were used to determine the most parsimonious models for prevalent CVD, CVD death and all-cause death. Quintiles of serum total adiponectin were added to each model to determine whether total adiponectin was a significant independent associate.
Results: At baseline, the patients were 63.9±11.4 years of age, 49.3% were male and they had been diagnosed a median [inter-quartile range] of 4.0 [1.0-9.0] years previously. Nearly half (49.1%) had a history of CVD; males had a significantly higher prevalence than females (52.3% vs 44.6%; P=0.006). Both males and females with prevalent CVD had significantly higher levels of total adiponectin than those without (6.0 [2.9-12.7] vs 5.3 [2.8-10.1] mg/L, P=0.036 for males; 9.2 [4.8-17.5] vs 7.8 [4.0-15.1] mg/L, P=0.003 for females). Serum total adiponectin quintile cut-points by sex were 3.2, 4.9, 6.6 and 10.2 mg/L for males and 4.9, 7.0, 9.6 and 14.8 mg/L for females. Serum total adiponectin was not independently associated with prevalent CVD for either sex (P=0.25). During follow-up, 479 deaths occurred (41.4%), 249 (52.0%) from CVD. Serum total adiponectin did not independently predict CVD death in either sex (P=0.24). For all-cause mortality, serum total adiponectin added to the Cox models for each sex (P=0.045) but not linearly. With the second quintile as reference, the highest quintile in males had a 64% increased risk of death (HR (95% CI) 1.64 (1.06-2.55); P=0.028). In females, the lowest, 4th and 5th quintiles had significantly higher risks of death (1.86 (1.04-3.33), 2.09 (1.19-3.68) and 1.96 (1.15-3.36), respectively; P<0.04 in each case).
Conclusions: Serum total adiponectin is not independently associated with prevalent CVD or CVD death in type 2 diabetes, but is an independent predictor of all-cause mortality with a 'U-shaped' relationship.

No conflict of interest

O-0203

Comprehensive risk assessments of diabetic patients from 7 Asian countries: the joint Asia diabetes evaluation (JADE) program

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Background: In this pandemic of diabetes, Asia has the highest number of affected people estimated to exceed 100 million. The Joint Asia Diabetes Evaluation (JADE) Program is the first web-based program to facilitate implementation of comprehensive care recommended by IDF. All enrolled patients underwent comprehensive assessment for risk stratification before triage into various care protocols. We report baseline data of these patients since the program commenced in November 2007.
Methods: The JADE electronic portal (JADE-portal) provides templates to guide data collection during annual comprehensive assessment and follow-up visits. Between Nov 2007 and Feb 2009, clinicians from 7 regions in Asia (HK, IN, KR, PH, SG, TW and TH) used the JADE-portal to manage their patients. Of the 4004 diabetic patients enrolled, 26 had type 1 diabetes, 3687 had type 2 diabetes and 291 had uncertain status. We analyzed the baseline data of the 3687 type 2 diabetic patients.
Results: Of the 3687 patients (PH 1186, HK 832, IN 788, KR 295, TH 275, SG 256, TW 55) [46.1% men, median (range) age: 58 (15-93 years), disease duration: 6.5 (0-71 years)], 10.0% had coronary heart disease, 3.3% had stroke, 3.1% had peripheral vascular disease (0.7% had lower limb amputation), 0.4% had renal failure, 16.2% had at least one of these cardiovascular-renal complications. A further 17.7% had diabetic retinopathy and 7.5% had chronic kidney disease (eGFR <60 ml/min/1.72m^2). Hypertension, dyslipidaemia and obesity affected 84.6%, 76.8% and 30.1% of subjects, respectively. For attainment of treatment targets, 35.3% had HbA_{1c} <7%, 32.3% had BP <130/80 mmHg and 34.0% had LDL-C at or <2.5 mmol/L. Only 5.4% had attained all 3 targets while 38.7% and 23.4% achieved 1 or 2 targets respectively. Using a validated JADE Risk Engine, patients were categorized into 4 risk levels (from low to high): Level 1, n=24 (0.7%); Level 2, n=707 (19.2%); Level 3, n=2358 (64.0%) and Level 4, n=598 (16.2%) which corresponded to a 5-year absolute risk of death or cardiovascular-renal events of 2.5%, 8%,

21.5% and 60%, respectively.
Conclusions: Apart from providing decision support and facilitating data collection for quality improvement purpose, the JADE Program enables clinicians to collect comprehensive data on a regular basis to identify high risk patients for intensified treatment.

No conflict of interest

ORAL PRESENTATION

Pregnancy and gestational diabetes

O-0204

Pregnancy in adolescents with diabetes

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Objective: To know the maternal and perinatal outcome in adolescent diabetic.
Patients and method: We retrospectively studied pregnancy outcome in 138 adolescent with diabetes (less than 20 years old), 101 of them were pregestational with diabetes and 37 gestational diabetes. We compared our findings with the pregnancy outcome in 242 nondiabetic adolescents and 482 non adolescent and non diabetic women from the same hospital randomised taking. We used the X2 test of Fisher and Z for the study of proportions.with a significance of $p < 0,05$.
Results: We detected that perinatal mortality of the adolescents with diabetes was similar in all groups, however the cesarean section rate, the frequency of preterm deliveries and the neonatal morbidity was significantly higher in the adolescents with diabetes. The frequency of congenital anomalies in the group of adolescent with diabetes was very high 8,0%(11/138).
Conclusion: All the adverse perinatal findings in the adolescents with pregestational diabetic group could be related with hyperglycaemia of very difficult control in 1 of each 3.

No conflict of interest

O-0205

Metabolic features and pregnancy outcomes of pregnant women with hyperglycemia

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Aims: To analyze metabolic features and pregnancy outcomes of pregnant women with hyperglycemia.
Methods: One hundred and thirty pregnant women were enrolled between August 2005 and December 2006 and divided into the normal glucose tolerance group (NGT, n=26), gestational impaired glucose tolerance group (GIGT, n=42), and gestational diabetes mellitus group (GDM, n=62) based on 75 g oral glucose tolerance test (OGTT). Fasting plasma glucose(FPG) and insulin, hemoglobin A1c (HbA1c), lipid spectrum and C-reactive protein(CRP) were measured. Pre-pregnant body mass index(pre-BMI), HOMA-IR, HOMA-B were calculated. Family history of diabetes and adverse pregnancy outcomes were recorded.
Results: Among three groups of GDM, GIGT and NGT, FPG (5.12±0.97mmol/L, 4.71±1.00mmol/L, 3.96±0.47mmol/L, respectively), FIns(9.16±3.98mU/L, 9.28±3.90mU/L, 5.90±3.95mU/L, respectively), HbA1c (5.67±0.76%, 5.62±0.61%, 4.03±0.27%, respectively), total cholesterol (5.54±1.33mmol/L, 5.12±1.23mmol/L, 4.20±1.07mmol/L, respectively), LDL-C(3.06±1.01mmol/L, 2.77±0.84 mmol/L, 2.27±0.77mmol/L, respectively), CRP (2.65 mg/L,3.82 mg/L,1.79 mg/L, respectively), HOMA-IR(1.88,1.82,0.86, respectively), pre-BMI(24.37±3.98kg/m^2, 24.32±2.83 kg/m^2, 22.24±2.79kg/m^2, respectively), the rate of cesarean delivery(71.0%, 52.4%, 19.2%, respectively), infant birth weight(3304.19±607.90g, 3345.48±462.74g, 2987.69±671.63g, respectively), maternal complications(69.4%,54.8%,23.1%, respectively), neonatal complications(29.0%,28.6%,3.8%, respectively) were significantly increased in the GDM and GIGT groups compared with those in the NGT group($P<0.05$). From NGT to GIGT to GDM, HOMA-B(295.75,168.76,126.25,respectively)tended to decrease in turn, there was significant difference between three groups($P<0.05$). Family history of diabetes was more commonly seen in the GDM group(38.7%)vs the NGT group(11.5%)($P<0.05$). Logistic analysis showed that adverse maternal-infant pregnancy outcomes were significantly related with pre-BMI, age and HbA1c.
Conclusions: Severe insulin resistance, ß-cell dysfunction, increased pre-BMI, lipid disorder, and hereditary susceptibility may be the main metabolic features of women with pregnant hyperglycemia. Pre-BMI, maternal age and HbA1c could be the risk factors of adverse maternal-neonatal complications.

No conflict of interest

O-0206

Inadequate screening for type 2 diabetes following pregnancy complicated by gestational diabetes

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Aims: Because of the high risk for the development of type 2 diabetes after gestational diabetes, clinical practice guidelines recommend screening with an OGTT between 6 weeks and 6 months after delivery for women who had gestational diabetes during pregnancy. The aim of this study was to evaluate trends over time in post-partum screening for diabetes after gestational diabetes.
Methods: The study used administrative data sources that provide detailed information on the health care utilisation of all residents of the Canadian province of Ontario (population=12 million). All women aged 17 to 49 without pre-existing diabetes who delivered between April 1994 and March 2008 were identified. Each woman who had gestational diabetes was matched with one who did not on age, region and year/quarter of delivery. For each year/quarter and for each group, the frequency of OGTTs and of any test that might be used to diagnose type 2 diabetes (i.e., OGTT, fasting glucose, random glucose or A1c) was determined up to 6 months post-partum.
Results: Screening with OGTTs after pregnancy with gestational diabetes increased from between 4 and 7% of pregnancies per year/quarter at the beginning of the study to between 13 and 17% of pregnancies at the end. This markedly exceeded the secular trend seen after pregnancies without gestational diabetes, where screening frequency increased from between 0 and 0.3% of pregnancies at the beginning to between 0.3 and 0.6% of pregnancies at the end. The use of any potential test that might diagnose type 2 diabetes after gestational diabetes increased from between 26 and 28% of pregnancies at the beginning of the study period to between 35 and 40% of pregnancies at the end.
Conclusion: Although an increasing number of women with pregnancies complicated by gestational diabetes were receiving OGTTs post-partum, the overwhelming majority of women were not receiving these tests. Even when considering a variety of tests that might have been used to diagnose type 2 diabetes, fewer than 40% of women with gestational diabetes were tested. This finding of inadequate screening in a high-risk population suggests that a large number of women of child-bearing age with type 2 diabetes remain undiagnosed.

No conflict of interest

O-0207

O´Sullivan test, A real screening test?

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Introduction: Glucose metabolism abnormalities during pregnancy are detected by an initial screening test with a 50 gram glucose oral intake, O´Sullivan Test (ST), and further confirmation by oral 100 gram glucose tolerance test (OGTT).
As there are discrepancies regarding whether the ST should be performed in the fasting (F) or in non fasting (NF) state and it is known that previous ingestion influences its results, some authors have questioned its value as a screening test.
Aim: In our hospital and due to lack of consensus criteria, the ST is performed either F or NF. The aim of our work was to study the influence of the F or NF

state in the efficiency of the test.
Subjects: A total number of 568 pregnant women were divided into two groups: 243 were fasting prior to ST and 325 had had breakfast before. Age was similar in both groups: 32 years ± 5SD, range 16-46, and a mean body mass index (BMI) of 23 kg/m2.
Methods: The ST consists of assessing serum glucose (SG) value 60 minutes after a 50 gram oral glucose intake and it is performed between week 24 and 28. A value higher than 140 mg/dl indicates the need for a confirmation test with a 100 g OCTT, performed in the fasting state.
Glucose measurement was done in serum samples in the Modular analytics autoanalyzer (Roche), with a hexokinase glucose enzyme test. The study also included a pre-sugar basal capillary blood glucose test.
Statistics: A SPSS program, version 12.0 was applied and measurements were compared using a "t-student" test for independent samples, assuming significant differences with a p value <0,05.
Results: 57% of subjects did the ST in F state and 43% in NF state.
Out of 568 TS performed, 19% had a positive result: 11% were done F and 8% were done NF.
Women who had eaten breakfast before ST, had higher basal capillary blood glucose test values before the glucose load than SG 60 minutes after it, which is a known fact related to improved insulin sensitivity.
Statistic analysis of SG values shows two different populations with normal distribution and statistically significant different values (p<0,0001), with a shift in the mean value from 122 mg/dl in those who were F to 110 mg/dl in those who were NF. The current 140 mg/dl cut-off value is equivalent to 127 mg/dl in those who are NF with the same typified coordinate.
Conclusion: The study demonstrates that performing ST postprandially can generate false negative results in this population when using the actual cut-off point and it outlines the need to establish a unique protocol for doing the ST, either fasting or non fasting, and to review the cut-off point in accordance with the new ADA criteria.

No conflict of interest

O-0208

National Cuban programme of diabetes in pregnancy

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Aims:
1. Reduce the morbility and mortality of children born to pregestational diabetics mothers.
2. To guarantee the active search and further treatment of gestational diabetes attending to the frequency of risk factors.

Methods: In Cuba, population of known diabetic women in childbearing age comprise aproximately 44,000 patients.
At the same time prevalence of gestational diabetes is 4,6% with an amount of 6,500 deliveries /year.
All the pregestational diabetic women that want to get pregnant are referred to specialized consultations of reproductive risk all over the country.
They receive integral preconceptional attention.
A glucometer is given to each patient in the case that pregnancy is advisable and she is instructed in its use to accomplish an optimal glycemic control. A monthly measurement of glycosilated hemoglobin is done. Criteria for good metabolic control are sustained values of glycosilated hemoglobin below 8% as well as preprandial glycemic values below 5,5 mmol/L and 2 hours postprandial values less than 6,6 mmol/L.
In 2008 the activity was expanded to the 87% of the country.
The patients are care by the same team before, during and after pregnancy.

Acumulative results of first 5 years (2003 - 2008)
Total deliveries in pregestational diabetics 1303
With preconceptional good control 635 (48,7%)
- Congenital malformation 6 (0,9%)
- Perinatal mortality 5 (0,8%)

Without preconceptional good control 664 (51%)
- Congenital malformation 51 (7,7%)
- Perinatal mortality 45 (6,8%)

The active search of gestational diabetes have not been fulfill nationwide and the prevalence in this moment is only 1,48%.
Conclusion: Our experience demonstrates the feasibility of this program to achieve a succesful outcome in pregnant diabetic.

No conflict of interest

O-0209

Women with former gestational diabetes exhibit similar incretin effect on beta cell function as healthy women after normal pregnancy

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Background and aims: Women with a history of gestational diabetes (fGDM) are at increased risk of developing diabetes and it is known that they present a reduced beta cell function under glucose stimulation. Incretin hormones contribute to augment glucose stimulated insulin production, after oral ingestion of glucose. With this study we aimed to assess the possible role that incretins may play in the altered insulin release of fGDM.
Materials and methods: We studied 105 non-diabetic fGDM women within 6 months after delivery (age=33.5±0.5 years (mean±SE); body mass index, BMI=27.3±0.5 kg/m^2, fasting glucose, G_b=4.68±0.07 mmol/l; fasting insulin, I_b=55±2 pmol/l; fasting C-peptide CP_b=569±31 pmol/l), compared to 38 healthy women after normal pregnancy, CNT (age=32±1, BMI=25±1, G_b=4.32±0.09 (p<0.005), I_b=51±4, CP_b=479±28). Every subject randomly underwent a 75g oral glucose test (OGTT) and a 0.33g/kg frequently sampled intravenous glucose test (IVGTT) with glucose and C-peptide measurements; both lasted 3h. Less than 3 weeks elapsed between the two tests, without any diet or habit changes in between. We calculated the area under the concentration curves (AUC) for glucose (AUC_{GL}) and C-peptide (AUC_{CP}) for 3 h in both tests. The suprabasal, dynamic AUC (dAUC) were computed by subtracting from the AUC the basal area (i.e., fasting value x 180 min). The beta cell function during OGTT (BC_{OG}) and that during IVGTT (BC_{IV}) were calculated according to the respective ratios: $dAUC_{CP}/dAUC_{GL}$. Percent incretin effect was assessed as $100x(BC_{OG} - BC_{IV}) / BC_{OG}$
Results: $dAUC_{GL}$ of fGDM was higher than that of CNT for both tests (338±20 mmol/l 3h vs. 189±21, p=0.0001 for OGTT; 206±13 vs. 119±16, p=0.0002 for IVGTT). $dAUC_{CP}$ were not different between fGDM and CNT and much higher (p<0.00001) during OGTT (285±9 nmol/l 3h vs. 257±15, p=0.13 fGDM vs. CNT for OGTT; 61±3 vs. 55±5, p=0.36 for IVGTT). BC_{OG} was found unchanged (1.82±0.44 nmol/mmol vs. 2.45±0.56, p=0.44 fGDM vs. CNT) while BC_{IV} was lower in fGDM (0.41±0.03 vs. 0.68±0.10, p=0.0006). BC_{OG} was markedly higher than BC_{IV} in both groups (p=0.003). Incretin effect resulted virtually the same (60±3 % in fGDM and 61±4 in CNT, p=0.7).
Conclusion: Women with a history of gestational diabetes, despite higher glucose, exhibit similar C-peptide release in both tests, indicating a reduced beta cell function. However, the elevated beta cell response during OGTT masks possible differences between fGDM and CNT, which instead are highlighted by IVGTT. Therefore, incretins have a potent effect in both groups, which is similar between former GDM and normal women.

No conflict of interest

ORAL PRESENTATION

Clinical outcomes and nutritional intake

O-0210

Disordered eating behaviours in type 1 diabetes mellitus patients

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Objective: Type 1 DM (Diabetes Mellitus) and disordered eating behaviours (DEBs) lead to an increased risk of poor diabetes outcomes. This includes poor metabolic control and increased risk of complications. This study was planned to examine the relationship between type I DM, DEBs and nutritional habits, anthropometric and biochemical parameters in Type 1 DM patients who were recruited to the Gülhane Military School of Medicine (GATA) Hospital, Endocrinology Clinic and healthy controls.
Methods: Total of 40 subjects (22 type I DM and 18 healthy controls) aged 10-30 years (9-13 years preadolescents, 14-18 years adolescents and 19-30 years old adult men and women) are conducted to the study and filled a basic information form (BIF), psychological tests such as Eating Attitudes Test (EAT), Body Image Scale (BIS) and Bulimia Investigatory Test Edinburg (BITE) for the determination of the DEBs. BMI (kg/m^2) is calculated by using weight (kg) and height (m). BEBIS-5 programme is used to evaluate nutritional consumption data and SPSS 13.0 programme is used for the statistical analysis.
Results: According to the EAT scores; DEBs were seen higher in type I DM people than the control group ($p>0.05$). In people who had DEBs were also investigated for the factors such as mother's and father's education, duration of diabetes and HbA_1C levels. But none of these factors was found to be statistically significant ($p<0.005$). Skipping meals was found statistically significant ($p<0.005$) between type I DM and control group. Educational resource for type I DM people are the dietitians (% 48.4), followed by doctors (% 37.9), nurses (% 10.3) and mass media (% 3.4), respectively. It was also found that as the age of diabetes increases, a decrease in HbA_1C levels were observed ($r=-0.524$). Age and HbA_1C levels are positively correlated ($r=0.213$).
Conclusion: DEBs seen in type I diabetes mellitus make the disease difficult to maintain. Metabolic control is important and has to be monitored. Although there are wave of articles on this topic, studies are still limited. This study indicates the importance of multidisciplinary team work and continuous education and testing of the education in specific times. There are limited studies in Turkey so further research is needed.

No conflict of interest

O-0211

A high protein diet with resistance exercise improves weight loss and body composition in overweight and obese patients with type 2 diabetes

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Aim: To evaluate the effects of two low fat energy restricted diets differing in carbohydrate protein ratio, with and without resistance exercise (Ex), on weight loss, body composition and CVD risk outcomes in overweight and obese patients with T2D.
Methods: In a parallel design, 83 men and women with T2D (age 56.12±7.53 yrs, BMI 35.4±4.6 kg/m^2) were randomly assigned to an isocaloric, energy restricted diet (females: 6 MJ/day, males: 7 MJ/day) of either high carbohydrate (HC; carbohydrate:protein:fat, 55:20:25) or high protein (HP; 40:35:25), with or without Ex (3 d/wk). Body weight and composition, waist circumference (WC) and cardiometabolic markers were assessed pre- and post-intervention.
Results: 59 participants completed the study. There was a significant time x group effect (P=0.04) for body weight, fat mass and WC such that the HP+EX had the greatest reduction for these parameters; weight (HC -8.61±4.61 kg, HP -8.98±4.82 kg, HC+Ex -10.52±5.10, HP+Ex -13.79±5.98), fat mass (HC -6.35±3.44 kg, HP -6.65±4.0 kg, HC+Ex -7.91±3.73 kg, HP+Ex -11.05±3.71 kg) and WC (HC -8.2±4.6 cm, HP -8.9±3.9 cm, HC+Ex -11.3±4.6 cm, HP+Ex -13.7±4.6 cm). Across the groups there was an overall reduction (P<0.001) in lean mass (-2.0•2.3 kg), blood pressure (-15/8•10/6 mmHg), fasting glucose (-2.1•2.2 mmol/L), insulin (-4.7±5.4 uM/L), HbA1c (-1.25•0.94 %), triglycerides (-0.47•0.81 mmol/L) total cholesterol (-0.67±0.69 mmol/L) and LDL-cholesterol (-0.37•0.53 mmol/L) with no significant difference between groups (P•0.17, time x group interaction).
Conclusion: An energy restricted high protein diet combined with resistance exercise resulted in greater weight loss and more favourable changes in body composition. All treatments had similar improvements in glycemic control and CVD risk markers.

No conflict of interest

O-0212

Effectiveness of shift work on lifestyle intervention in overweight subjects with prediabetes

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Aims: Prediabetes (PD), meaning impaired fasting glucose or impaired glucose tolerance, is an increasing event over the last years. Moreover, it can accelerate the incidence of Diabetes Mellitus (DM) when it is combined with obesity and disturbances of sleep-wake cycle due to irregular shift work. This study examines if lifestyle intervention (LSI) in overweight subjects with PD has the same results in individuals working fixed or rotational shifts.
Methods: One hundred-four subjects (range 40-56 years old) were joined this study and formed 2 age groups, 40 to 49 and 50 to 56. Inclusion criteria were overweight people (BMI = 25 - 29.9) not receiving any hypoglycaemic medicines and who had at their last blood results Fasting-Glu 100 to 125 mg% and / or 2 hours –postprandial Glu 140 to 199 mg%. Subjects formed 2 groups, 52 of them having fixed working shifts (Group A) and 52 having rotational working shifts with at least one night shift of eight hours every week (Group B). All of them received the same instructions of LSI about diet modification, weight loss, exercise, smoking cessation, etc. After 18 months of follow up, we examined how many of them had normal or near-normal fasting Glu equal or less than 110 mg% and normal or near-normal postprandial Glu equal or less than 154 mg%, as well as how many suffered from DM. For the statistical analysis of the data the Fischer's exact test was used.
Results: Fifteen subjects (28.8%) of Group A and 6 subjects (11.5%) of Group B maintained normal or near normal Glu blood levels ($p= 0.049$, Relative risk = 1.602, 95% Confidence Interval: 1.116 to 2.300). Additionally, 14 subjects (13%) became diabetics by the end of the study, that is five (9.6%) of group A and nine (17.3%) of group B ($p= 0.072$, Relative risk = 0.428, 95% Confidence Interval: 0.156 to 1.178). No statistically significant differences were found between men and women as well as between the pre-mentioned age groups.
Discussion/conclusion: Our study shows that LSI may provide better results in overweight subjects with PD and with fixed working schedule, due mainly to easier adaptation to the changes in their lifestyle from those having rotational working shifts. Both normal sleep loss and misalignment of the circadian rhythm with respect to the sleep-wake cycle may result in bad glycaemic control of prediabetics with irregular working schedule. Although a smaller number of patients in group A, compared to group B, suffered from DM after 18 months of LSI, the result may show a trend but did not prove statistically significant.

No conflict of interest

O-0213

Effect of dietary pulses on glycemic control in people with and without diabetes: Meta-analyses and meta-regression models of experimental randomized trials

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Background: Dietary non-oil seed pulses (chickpeas, beans, peas, lentils, etc.) are a good source of slowly-digestible carbohydrate, fibre, and vegetable protein and a valuable means for lowering the glycemic-index (GI) of the diet. To assess the evidence that dietary pulses may benefit glycemic control, we conducted meta-analyses and meta-regression models of randomized experimental trials investigating the effect of pulses alone or as part of low-GI or high-fibre diets on markers of glycemic control in people with and without diabetes.

Methods: We searched MEDLINE, EMBASE, CINAHL, and the Cochrane Library for relevant controlled trials of =7d. Two independent reviewers (AE, JMW) extracted information on study design, participants, treatments, and outcomes. Data were pooled using the generic inverse variance method and expressed as standardized mean differences (SMD) with 95% CI, where <0.4, represents a small effect size, 0.4-0.7, a moderate effect size, and >0.7 a large effect size. Heterogeneity was assessed by c^2 and quantified by I^2. Meta-regression models identified independent predictors of effects.

Results: Forty-one trials (39 reports) were included. Pulses alone (11 trials) lowered fasting blood glucose (FBG) (-0.71 [-1.24, -0.17]) and insulin (-0.62 [-1.05, -0.19]). Pulses in low-GI-diets (19 trials) lowered glycosylated blood proteins (GP), measured as HbA1c or fructosamine (-0.28 [-0.42,-0.14]). Finally, pulses in high-fibre diets (11 trials) lowered FBG (-0.32 [-0.49, -0.15]) and GP (-0.27 [-0.45, -0.09]). Inter-study heterogeneity was high and unexplained for most outcomes with benefits modified and predicted by diabetes status, pulse type, dose, physical form, follow-up, macronutrient profile of background diets, design, and study quality.

Conclusions: Pooled analyses demonstrated that pulses alone or in low-GI or high-fibre diets improve markers of longer term glycemic control in humans with significant heterogeneity. There is a need for further large, well designed trials to address the heterogeneity in the data.

Conflict of interest:
Advisory board: Dr. Cyril WC Kendall serves on the scientific advisory board for Pulse Canada and has served on the scientific advisory board, received research support, travel support, consultant fees, or honoraria from Barilla, Solae, Unilever, Haine Celestial, Loblaws Inc., Oldways Preservation Trust, the Almond Board of California, the International Nut Council, Paramount Farms, the California Strawberry Commission, and the Canola and Flax Councils of Canada.
Dr. David JA Jenkins has served on the scientific advisory board for or received research support, consultant fees, or honoraria from Barilla, Solae, Unilever, Haine Celestial, Loblaws Inc., Sanitarium Company, Herbalife International, Pacific Health Laboratories Inc., Metagenics/MetaProteomics, Bayer Consumer Care, Oldways Preservation Trust, The Almond Board of California, The California Strawberry Commission, Orafti, and the Canola and Flax Councils of Canada.
Other substantive relationships: Dr. John L Sievenpiper, Dr. Cyril WC Kendall, and Dr. Richard P Bazinet have received consultant fees from Pulse Canada via BDSK consulting Inc. Toronto, ON, CANADA.

O-0214

Dose response effect of mixed nut intake on blood lipids and glycemic control in type 2 diabetes

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Background and aims: Nuts have been shown to reduce serum cholesterol and the risk of cardiovascular disease and diabetes but few studies have assessed the effect of nuts on glycemic control. Our aim was to assess the effect of two doses of mixed nuts on serum lipids and glycemic control in subjects with type 2 diabetes.

Materials and methods: 117 type 2 subjects with diabetes treated with oral hypoglycemic medications were randomized to one of three treatments for three months: 75 g mixed nuts; 38 g mixed nuts and half portion of muffins; and full portion of muffins. Supplements provided 475 kcal per 2000 kcal diet. The primary outcome was change in HbA1c with serum lipids, CRP, body weight and blood pressure as secondary measures.

Results: Using an intention-to-treat analysis of the data (n=117), only after full dose nuts was a significant reduction from baseline seen in HbA1c of -0.2 ± 0.05 HbA1c % units (P<0.001)) whereas for half nuts plus muffin and muffin alone the respective results were -0.05±0.07, (P>0.05) and -0.05±0.06 HbA1c (P>0.05). Significant differences were also seen between nuts and muffins with greater falls on nuts for LDL-C (-0.19±0.12 mmol/L, P=0.03). Nut intake directly related to change in LDL-C (r= -.24, n=98, P<0.05).

Conclusion: Consumption of mixed nuts daily may improve serum lipids and glycemic control in type 2 diabetes.

Conflict of interest:
Paid lecturing: Dr. John L Sievenpiper has recieved honoraria from Archer Daniels Midland.
Advisory board: Dr. Cyril WC Kendall serves on the scientific advisory board for Pulse Canada and has served on the scientific advisory board, received research support, travel support, consultant fees, or honoraria from Barilla, Solae, Unilever, Haine Celestial, Loblaws Inc., Oldways Preservation Trust, the Almond Board of California, the International Nut Council, Paramount Farms, the California Strawberry Commission, and the Canola and Flax Councils of Canada.
Dr. David JA Jenkins has served on the scientific advisory board for or received research support, consultant fees, or honoraria from Barilla, Solae, Unilever, Haine Celestial, Loblaws Inc., Sanitarium Company, Herbalife International, Pacific Health Laboratories Inc., Metagenics/MetaProteomics, Bayer Consumer Care, Oldways Preservation Trust, The Almond Board of California, The California Strawberry Commission, Orafti, and the Canola and Flax Councils of Canada.
Other substantive relationships: Dr. John L Sievenpiper and Dr. Cyril WC Kendall have received consultant fees from Pulse Canada via BDSK consulting Inc. Toronto, ON, CANADA.

ORAL PRESENTATION

Complications - neuropathy

O-0215

Corneal confocal microscopy: a novel surrogate marker for diabetic autonomic neuropathy

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The accurate quantification of the severity of diabetic autonomic neuropathy (DAN) can be time consuming and challenging. At present, most clinicians undertake cardiac autonomic function tests to use as a surrogate of autonomic neuropathy of the GI tract. We undertook a range of tests of small fibre and autonomic neuropathy including the novel technique of corneal confocal microscopy (CCM) to define how they may detect and quantify the severity of DAN in patients with gastroenteropathy.

20 subjects with diabetic gastroenteropathy and 14 control subjects underwent cardiovascular and peripheral autonomic function testing to establish the Composite Autonomic Severity Score (CASS). Quantitative Sensory testing (QST) was performed to assess the severity of somatic neuropathy and corneal sensitivity and CCM were performed to quantify c-fibre dysfunction and damage.

12 patients (60%) had moderate-severe DAN (CASS 4.0 ± 2.2). Corneal Nerve Fibre Density (NFD) 17.8 ± 13.3 (95% CI 11.6-23.9) vs 48.3 ± 12.4 (95% CI 41.1-55.4), Nerve Branch Density (NBD) 8.9 ± 7.9 (95% CI 5.2-12.6) vs 30.1 ± 5.3 (95% CI 27.0-33.2) and Nerve Fibre Length (NFL) 3.6 ± 3.1 (95% CI 2.1-5.2) vs 9.7 ± 2.5 (95% CI 8.3-11.2) were all significantly reduced in DAN vs controls (p<0.0001) and corneal sensation threshold was significantly elevated 1.6 ± 0.9 (95% CI 1.2-2.1) vs 0.7 ± 0.2 (95% CI 0.6-0.8); (p <0.0004). Corneal abnormalities correlated highly significantly with the severity of DAN

(CASS vs NFD [r = -0.713], NBD [r = -0.726], NFL [r = -0.786] and CS [r = 0.659]; p<0.0001).
Patients with DAN had significant corneal nerve abnormalities compared to healthy controls and the severity of nerve damage was very strongly associated with the severity of autonomic neuropathy. Thus CCM may act as a simple non-invasive surrogate marker for DAN in patients with diabetic gastroenteropathy.

No conflict of interest

O-0216

Assessment of neuropathy in patients with impaired glucose tolerance and idiopathic neuropathy: novel diagnostic technique

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Patients with idiopathic small fibre neuropathy (ISFN) have been shown to have significant intraepidermal nerve fibre loss in skin biopsies and also an increased prevalence of impaired glucose tolerance (IGT). From these data it has been inferred that IGT contributes significantly to small nerve fibre damage. However, skin biopsy is an invasive procedure therefore we have used corneal confocal microscopy, a novel non-invasive technique to quantify small nerve fibre damage in patients with ISFN.
25 patients with idiopathic painful neuropathy underwent an Oral Glucose Tolerance test (OGTT) and together with 12 aged-matched control subjects detailed evaluation of neuropathy using: Neuropathy Symptom Profile (NSP), Neuropathy Deficit Score (NDS), Nerve Conduction Studies (NCS), Quantitative Sensory Testing (QST) (vibration and thermal thresholds) and corneal confocal microscopy (CCM) to assess neuropathic deficits.
8 (32%) of patients had IGT. Whilst all patients with ISFN had significant neuropathic symptoms, NDS, NCS and QST, except for warm thresholds, were normal. However, CCM demonstrated a highly significant reduction in corneal nerve fibre density (NFD) (P<0.0001), nerve branch density (NBD) (P<0.0001), nerve fibre length (NFL) (P<0.0001) and an increase in nerve fibre tortuosity (NFT) (P<0.0001). These parameters did not differ between patients with and without IGT, nor did they correlate with BMI and blood pressure
Corneal confocal microscopy provides a means to accurately quantify small nerve fibre damage in patients with ISFN. Furthermore, we demonstrate that although IGT is increased compared to the general population in this group it does not influence the severity of nerve damage, challenging the role of IGT in neuropathy.

No conflict of interest

O-0217

Evaluation of the relationship between gastric emptying, the current glucose levels and neuropathy in patients with type 1 diabetes mellitus

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The possible correlations between the severity of autonomic neuropathy (AN), the current glucose levels and gastric emptying are still not clearly explored.
Aims: The aims of our study were to evaluate gastric emptying during a continuous glucose monitoring and to assess the severity of AN in patients with type-1 diabetes (DM). Patients and methods: 17 patients with type 1 DM were included into the study (HbA1c: 8.3±0.2%, age: 34.9±2.2 years, duration of DM: 15.7±2.8 years; mean±SE). 9 subjects were healthy controls. Stomach motility was evaluated by a scintigraphic gastric emptying procedure. The subcutaneous glucose levels were measured by a continuous glucose monitoring system (CGMS, Medtronic Sàrl) during the total interval of the gastric emptying. The five standard cardiovascular reflex tests were applied for the assessment of AN. Sensory nerve integrity was studied with a Neurometer (Neurotron Inc., Baltimore, MD).
Results: There was a trend for a longer gastric emptying in diabetic patients compared to healthy subjects ($T_{1/2}$: 80.1±9.8 vs 49.6±5.5 min., p=0.06, diabetic vs control). The ratio of abnormal gastric emptying among diabetic patients was 7/17. No correlations were found between the glucose levels recorded during the gastric emptying (the lowest and highest, the mean, the difference of highest and lowest glucose) and the gastric motility. Gastric emptying in groups of patients created by the different glucose parameters did not differ significantly. There was no correlation between HbA1c values and the gastric motility. Moderate to severe AN was found in diabetic patients (AN: 3.1±0.4 vs 0.3±0.2 p<0.001, heart rate response to beathing: 16.8±1.8 vs 26.3±2.3 beats/min, p<0.01; 30/15 ratio: 1.02±0.02 vs 1.21±0.04, p<0.01; handgrip: 14.6±2.8 vs 28.3±3.5 mm Hg, p<0.05; diabetic vs control). The current perception thresholds (CPT) on the peroneal nerve at 5 Hz of the patients differed from controls (CPT: 2.89±0.9 vs 0.68±0.07 mA, p<0.05 indicating hypaesthesia).
Conclusions: There was no correlation between gastric emptying and actual glucose levels assessed by continuous glucose monitoring. Slower gastric emptying was found in the presence of a moderate to severe autonomic and sensory neuropathy in patients with a 15-year-long duration of type 1 diabetes. These data suggest that severity of autonomic neuropathy rather than the current glucose levels may have importance in the pathogenesis of delayed gastric emptying in diabetic patients.

No conflict of interest

O-0218

Comparison of the analgesic efficacy and safety between Tramadol/Acetaminophen combination tablet (Ultracet) and gabapentin for the treatment of painful diabetic neuropathy: Multicenter, randomized, open comparative study

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Objectives: The goal of this study was to compare the efficacy and safety with tramadol/acetaminophen(T/A) and gabapentin(G) in the management of painful diabetic neuropathy.
Methods: This 6-week, multicenter, randomized, open comparative study was conducted at 13 tertiary referral university hospitals in the Republic of Korea. Subjects aged 18 to 75 years with painful symmetric neuropathy in the lower limbs and with a mean pain-intensity score of =4 on numeric rating scale(NRS) (0=no pain to 10=worst pain) during the 48 hours prior to enrollment were eligible. Subjects were randomized to 1 of 2 treatment groups. The primary efficacy measure was the reduction of pain intensity. Secondary measures included scores on the pain relief score, measured on a 6-point scale (complete relief=4, a lot of relief = 3, moderate relief = 2, slight relief = 1, no relief = 0, worse pain = -1), Brief Pain Inventory (BPI), 36 item Short-Form Health Survey (SF-36), subjects' and investigators' mean overall assessments of study drug, measured on a Likert scale (from 2 = very good to -2 = very poor), and average pain intensity (NRS) for the last 24 hours and sleep disturbance due to pain in the lower limbs, based on the record of subject's diary.
Results: One hundred and thirty-nine subjects (T/A, 66, G, 73) were included in the intention to treat population. The 2 groups were similar in terms of baseline pain intensity (mean intensity [SD], T/A, 6.7[1.6] vs G, 6.3[1.6]) and demographic characteristics(mean age, T/A, 58.2 vs G, 56.9 years). The mean pain intensity differences were similar between two groups (mean change score[SD], T/A, -3.1[2.0] vs G, -2.7[2.1]; p=NS). Both groups had similar improvements on the every subcategories of the SF-36 and BPI. Mean pain relief scores were also similar between two groups (mean change score [SD], T/A, 2.1[1.1] vs G, 2.0[1.2]; p=NS). No significant difference appeared between groups in the total number of treatment-associated adverse events (total number (percentage), T/A, 40(50.6) vs G, 31(36.9); p=NS).

Conclusion: The results of this study suggest that tramadol/acetaminophen combination tablets(Ultracet) are as effective as gabapentin for the treatment of painful diabetic neuropathy.

Conflict of interest:
Commercially-sponsored research: Authors Cha B.Y., KO K.S., Kim D.S., Yu J.M., Baik S.H, Son H.S., Park T.S., Park I.B., Lee J.H., Mok J.O., Kim J.H., Noh J.H.This study was sponsored by JANSSEN KOREA

O-0219

Severe symptomatic diabetic gastroparesis and cardiovascular tests exhibit a close relationship

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Diabetic gastroparesis is associated with autonomic dysfunction, but the nature of this relationship remains elusive. This study presents detailed clinical data.
Aim: To describe Type 1 diabetes patients suffering severe symptomatic gastroparesis.
Subjects: 19 consecutively recruited type 1 diabetes patients (6 males and 13 females) with delayed gastric emptying and correlating symptom scores. Age 43 years (+/- 14 years). Diabetes duration 21 years (+/- 8 years). Body mass index 26 (+/- 5). All demonstrated autonomic symptoms from more than one organ system.
Method: Cardiovascular autonomic neuropathy (CAN) was assessed by heart rate variability resting, expiration:inspiration and heart rate variability from lying to standing. A ^{13}C-octanoic breath test determined rate of gastric emptying and symptom scores by a validated questionnaire. All patients underwent thorough physical, paraclinical and clinical examinations including endoscopies.
Results: Gastric emptying rates were all significantly increased ($T^1/_2$ = 152 minutes (+/- 33 minutes). All patients but two were diagnosed with CAN. Of the 17 patients exhibiting CAN, 7 were at an early stage of progression whereas 10 were at an endstage of CAN. Blood pressure lying down 140/82 mmHg (systolic +/- 29 mmHg and diastolic +/- 14 mmHg) and blood pressure standing 126/83 mmHg (systolic +/- 32 mmHg and diastolic +/- 15 mmHg) signifies postural hypotension. On validated questionnaires all patients demonstrated symptoms pathognomic for gastroparesis and severely so.
Discussion: Examination for CAN may support a gastroparesis diagnosis in Type 1 diabetes patients suffering upper gastrointestinal symptoms. The finding of CAN in a Type 1 diabetes patient may warrant a need for further investigations regarding gastric motility.
Conclusion: All consecutively recruited patients suffered symptomatic gastroparesis and all but two patients demonstrated cardiovascular autonomic dysfunction. There exists a close relationship between severe gastric motility and cardiovascular autonomic neuropathy.

No conflict of interest

O-0220

Thalamic microvascular perfusion abnormalities that provide clues to the pathogenesis of pain in diabetic neuropathy.

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Central and peripheral mechanisms have been implicated in the pathogenesis of painful diabetic neuropathy (DN). Within the central nervous system, the thalamus plays a crucial role in modulating and processing somatosensory information that is presented to the cortex. We have demonstrated that thalamic neuronal dysfunction occurs in painless but not painful DN. In this study, we investigate the pathogenesis of thalamic dysfunction by testing the hypothesis that specific thalamic perfusion abnormalities occur in painful and painless DN.
A total of 23 subjects, 18 right-handed, subjects with type-1 diabetes (no-DN=6, painful-DN=5, painless-DN=7) and 5 healthy volunteers (HV), underwent detailed neurophysiological assessments (NIS[LL]+7 tests). Cerebral parenchymal perfusion was assessed by tracking an intravenous bolus of contrast agent using a multi-time point, T2* EPI sequence on a 1.5T magnetic resonance imaging system. Parenchymal perfusion was expressed as relative cerebral blood volume (rCBV), flow (rCBF) and bolus transit time (ttFM). Thalamus and caudate nucleus (control) haemodynamic properties were examined.
Subjects with painful-DN had significantly higher thalamic rCBV (painful DN, mean(SD) 228.7(19.5); No-DN, 202.3(25.8); painless DN, 216.5(65.5); HV, 181.9 (51.7); p=0.04). Subjects with painful DN also had the longest ttFM (Painful DN, 38.4 (3.6); No-DN, 35.3 (13.2); painless DN, 35.9 (13.7); HV, 33.7 (14.9; p = 0.07) and lowest mean thalamic rCBF (painless DN, 6.51 (2.8), No-DN, 6.52 (1.3); Painful DN, 5.93 (0.5); p = 0.08). There were no significant differences in the perfusion properties of the caudate nucleus between subgroups.
These findings imply that painful-DN is accompanied by thalamic vascularity, whereas vascularity is reduced in painless-DN. Similar changes were not demonstrated in the caudate nucleus, which served as a control region. The caudate is a deep brain nucleus not thought to play a major role in somotosensory perception. Therefore, unique pathophysiological thalamic microvascular changes are demonstrated that may provide important clues to the pathogenesis of pain in DN.

No conflict of interest

O-0221

Health-related outcomes associated with tapentadol extended release (ER) treatment for the management of painful diabetic peripheral neuropathy (DPN): results of a randomized-withdrawal phase 3 trial

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Aims: To evaluate health survey results associated with tapentadol ER treatment for the relief of DPN pain.
Methods: Patients were titrated to an optimally effective and tolerable dose of tapentadol ER (100-250mg bid) during a 3-week open-label (OL) phase. Patients with >=1 point improvement in pain intensity (0-10 NRS) were randomized 1:1 to tapentadol ER or placebo during a 12-week double-blind (DB) phase. Efficacy was evaluated as change in mean pain intensity from start to end of the DB phase using last observation carried forward for missing values. The short form (SF)-36 health survey (evaluates 8 dimensions of physical, social, and mental well-being and 2 summary scores) was completed at pre-specified time points.
Results: In the OL phase, 588 patients received >=1 dose of tapentadol ER and were analyzed for safety; in the DB phase, 389 patients received >=1 dose of study drug and were analyzed for safety and efficacy. On average, patients receiving tapentadol ER in the DB phase maintained the improvement in pain intensity scores observed during the OL phase, but those receiving placebo worsened (least squares mean difference vs placebo, -1.3; P<0.001). Treatment with tapentadol ER was associated with numerical improvements in all SF-36 scores from start to end of the OL phase (Table). On average, patients who received tapentadol ER during the DB phase maintained these improvements, while patients who were switched to placebo worsened with significant between-group differences observed not only for bodily pain, but also for role-physical, social functioning, and physical component summary scores (all P=0.012).

Table1: Mean (SD) Changes in SF-36 Scores (DB, n=389)

Treatment-emergent adverse events reported by >10% of patients treated with tapentadol ER were nausea, dizziness, somnolence, and constipation (OL) and nausea (DB).
Conclusions: Tapentadol ER was effective and well tolerated by patients with moderate to severe DPN pain and was associated with improvements in health status that were maintained over 12 weeks of treatment.

Conflict of interest:
Employee: ME, DYS, AO, and CR are employees of Johnson & Johnson. RK and RL are employees of Grünenthal GmbH.

table 1

	Change from start to end of OL		Change from start to end of DB	
	Tapentadol ER switched to placebo in DB	Tapentadol ER in both phases	Placebo	Tapentadol ER
Physical functioning	12.1 (18.6)	14.3 (19.0)	-2.9 (18.7)	0.1 (17.8)
Role-physical	25.4 (41.9)	24.5 (43.5)	-10.9 (41.5)	0.5 (37.6)
Bodily pain	22.7 (22.0)	24.0 (21.1)	-7.8 (20.6)	-0.5 (16.2)
General health	3.4 (13.1)	5.8 (14.5)	-1.8 (12.1)	-1.2 (12.2)
Vitality	8.3 (20.8)	10.8 (19.0)	-2.1 (18.4)	-2.0 (18.7)
Social functioning	11.9 (23.8)	16.2 (26.0)	-4.2 (19.6)	0.8 (19.1)
Role-emotional	19.9 (44.5)	18.6 (42.8)	-7.2 (42.0)	0.5 (36.1)
Mental health	4.2 (16.2)	5.6 (16.7)	-2.3 (14.7)	0.0 (12.6)
Mental component summary	3.0 (10.3)	3.8 (10.1)	-1.2 (8.7)	-0.0 (7.1)
Physical component summary	6.8 (7.5)	7.4 (8.1)	-2.3 (7.7)	-0.2 (7.4)

WORKSHOP

HEALTHCARE AND EPIDEMIOLOGY

From theory to practice: a presentation of three translational research projects supported by IDF BRIDGES

0222

Presentation of BRIDGES including result of second round of funding

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Rationale and objective of BRIDGES: Despite the recent revolution in scientific knowledge and the introduction of many new diabetes treatments, there remains a major gap between what has been learned through clinical research and what is done in clinical practice to successfully support patient behaviour modification. BRIDGES, an International Diabetes Federation project supported by an educational grant from Eli Lilly and Company was created to identify realistic ways for achieving better outcomes for people with diabetes, to financially support projects testing new hypothesis, and interventions trying to close this gap, and to help halt the progression of this disease.

Setup of BRIDGES: BRIDGES solicits proposals supporting cost-effective and sustainable interventions that can be adopted in real-life settings for the prevention and control of diabetes. To be eligible for support, projects must be based on an initiative that have been proved to be effective in trials to prevent and treat diabetes, improve the care of people with diabetes and delay related complications. Importantly, such interventions must also have the potential to be put in clinical practice in a range of settings and to be widely disseminated to people with diabetes and their communities.

BRIDGES provides funding for two types of initiatives: short and long-term projects. Short term projects should have a maximum duration of 2 years with funding not in excess of US$65,000 and should test hypothesis linked to translational research. Long term projects should have a maximum duration of 3 years with funding not in excess of US$400,000 and should be dedicated to the implementation of the hypothesis.

What has been achieved so far: The first round of funding was concluded in 2007. More than 107 applications were received from all over the world and, following a strict review process, 11 projects were selected and are currently being financially supported. All the projects are ongoing, but the first results received are extremely encouraging. During the morning session, you will have the opportunity to listen to 3 of the supported projects. In the poster area, you will have the possibility to discover the others.

With 147 applications from 56 countries received this year for the second round, BRIDGES demonstrates its global remit, its importance and relevance in today's diabetes community. All the projects received have been thoroughly assessed by the BRIDGES Review Committee and the final selection took place in Montreal just before the beginning of the 20th World Diabetes Congress. The results will be announced at the beginning of 2010.

The third round of BRIDGES will take place during Q2 and Q3 of 2010.

BRIDGES does not only provide grants. In 2008, the International Diabetes Federation organized and financially supported 6 workshops around the world to help potential scientific grant applicants to develop tools, skills and knowledge on study design, methodology and project management as well as to increase their capacity to develop state of the art projects and fundraising. Out of 64 participants at the workshops, 36 have applied to the second round of funding of BRIDGES. 47% developed a letter of intent which was considered of sufficient interest to be asked to complete a full application.

Conflict of interest:
Other substantive relationships: Jean Claude Mbanya is Chair of the Bridges Executive Committee

0223

Translational research and diabetes

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Project title: A Translation Randomized Trial of a Culturally Specific Lifestyle Intervention for Diabetes Prevention in India

Research question(s)/hypothesis: To evaluate the effectiveness, cost-effectiveness, and sustainability of a culturally specific lifestyle intervention in India

Method(s): 700 people with pre-diabetes (Fasting plasma glucose≥100-125 mg/dl and/or 2-hour glucose≥140-199 mg/dl) living in Chennai, India will be randomized to receive either standard lifestyle advice or a culturally specific lifestyle intervention. The 16-week intervention will include: culturally appropriate exercise including walking, strength training, and yoga-based stretching; lifestyle classes focusing on behavior change and modifying the Indian diet for weight loss, portion control, and making healthy food choices; peer support groups; and use of lay educators for teaching and support. The intervention will be followed by a less intensive 8-week maintenance period and 6-12 months of additional follow-up. Program effectiveness will be measured by longitudinal regression models with diabetes incidence and changes in secondary outcomes (including body composition, fasting glucose, plasma lipids, activity, and diet) as outcome measures. Cost-effectiveness of the lifestyle intervention will be determined by assessing the incremental costs and benefits per: case of diabetes prevented and Quality-adjusted Life-year. The acceptability and sustainability of the program will be determined through focus group discussions and interviews with intervention participants.

Public health significance: Data from this study will be used to design and advocate for the implementation of scalable, low-cost, culturally specific lifestyle interventions for the prevention of diabetes in India and other South Asian countries.

Sustainability plan: Plans for sustainability include: (1) lay interventionists will be enabled and empowered to continue teaching lifestyle classes after the study is complete; (2) program materials can be used after the intervention; (3) study results will be presented to health policy makers in India, in the hopes that this program can be implemented on a wider scale.

No conflict of interest

0224

Effectiveness of a community-based Diabetes Self-Management Education (DSME) program: A pilot study in San Juan, Batangas, Philippines

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Diabetes Self-Management Education (DSME) has been recognized as a fundamental component of diabetes care. To successfully establish a DSME Program in a rural community in the Philippines, the present project consists of 4 phases.

Phase I involved conducting comprehensive community assessment by determining knowledge, attitudes and practices using locally validated questionnaires and conducting focused group discussions. Data from 156 participants showed low overall knowledge score with a mean of 42.71%, lowest in the self-monitoring subscale. Most respondents did not believe in the seriousness of diabetes. Data derived from this preliminary study were incorporated into the program educational materials.

Phase II constitutes prevalence survey of diabetes, impaired glucose tolerance and metabolic syndrome in the rural community. Using a two-stage stratified random sampling method, this phase included 324 residents. Known diabetics constitute 10% of the sample while 19% were newly-diagnosed diabetics. At least 30% satisfied the criteria for metabolic syndrome.

Phase III determines the effectiveness of community-based DSME in improving physiologic measures and health behaviors. Using translated and culturally-modified IDF modules, participants were randomly allocated either to receive DSME program (intervention) or traditional care (control). Peer educators, either ***barangay*** (socio-political unit) health workers or diabetic patients active in the ***barangay***, conducted the DSME program, a 12-week course incorporating strategies to enhance self-management. Data were compared at baseline and after 3 and 6 months after initiation of the program.

Phase IV will tackle diabetes prevention among high-risk community residents identified during Phase II as well as prevention of diabetes complications among known diabetics.

This pilot study is part of a long-term, self-sustaining diabetes program which aims at reducing the burden of diabetes particularly in the rural community. The investigators envision a program that will serve as a "model of community diabetes care" throughout the Philippines by providing culturally-appropriate and comprehensive diabetes care.

No conflict of interest

0225

Feasibility of developing a training program for peer educators in diabetes

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Background: Professionally-led diabetes self-management education (DSME) interventions are effective in improving diabetes-related health outcomes, but these gains cannot be sustained without continued follow-up and support. Interventions involving peer support have been associated with positive changes in metabolic, cardiovascular, and psychosocial functioning and offer a promising solution to ongoing diabetes self-management support (DSMS). However, existing peer support interventions are time-limited, curriculum-led, and highly structured.

Aims: This study develops a theoretically-driven program for training peer leaders to lead ongoing, empowerment-based, DSMS interventions. The objectives of this pilot study are (1) to determine the feasibility of developing a program training peer leaders to facilitate empowerment-based interventions that support long-term diabetes self-management, and (2) to determine the feasibility (e.g., recruitment, attendance, future intentions) of conducting a peer leader training (PLT) program to facilitate empowerment-based DSMS interventions.

Methods: This study follows a prospective, pre-post design consisting of two phases. Phase 1 involves the development of a PLT program designed to equip peer leaders with the knowledge, skills, and attitudes to facilitate an ongoing empowerment-based DSMS intervention. Phase 2 involves the implementation and evaluation of the PLT program and will recruit adults with type 2 diabetes as peer leaders. Participants will complete measures assessing diabetes knowledge, empowerment-based facilitation skills, motivational interviewing-based communication skills, and self-efficacy.

Discussion: By training peers to support the ongoing self-management efforts in their own community, interventions will have more relevance to the cultural norms, social dynamics, and economic circumstances of the community while promoting long-term maintenance of behavior change. Using peer-led interventions increases the ability to translate effective empowerment-based programs into existing community infrastructures. This approach is designed to be ongoing, patient-driven, and flexible to the evolving conditions of patients' "real-word" environment. If successful, this intervention can be adapted to other at-risk populations in the United States and abroad.

Conflict of interest:
Stock ownership: Spouse has stock in Amylin.

0226

Tackling diabetes as a 'communicable' disease in the Middle East

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The Middle East is currently experiencing a growing diabetes epidemic that threatens to undermine the social, political, and economic stability of the region. In 2004, 15% of Jordanians adults had diabetes and 12% had impaired fasting glucose. Addressing the impact of the diabetes epidemic in Jordan requires a sustainable strategy working at multiple levels: individual, community, and health care system. The Jordan Micro-Clinic Project aims to provide an evidence-based comprehensive national strategy using community-based "micro-clinics," a social network of diabetes patients, to promote healthy behaviors within economically disadvantaged communities in Jordan. The project was piloted in Amman, in which 1) health care professionals and patients were trained and educated in diabetes prevention and management, 2) project participants were recruited into micro-clinic groups (consisting of 2-8 family members or friends of the same social network) and shared technology for glucose monitoring, and 3) micro-clinic groups participated in ongoing social activities and education around diabetes management. Pilot findings revealed a significant drop in BMI and mean glucose levels for all participants after four months, indicating improvements in diabetes management based on program participation. The project is currently undergoing a regional expansion pilot to reduce the impact of diabetes in multiple sites, targeting various geographic areas and demographic groups. Quantitative and qualitative data will be used to assess the effectiveness of the micro-clinic model on improving diabetes management among participants. Demographic and biomedical (HbA1c, BMI, and fasting glucose measurements) will be collected from members of each micro-clinic at several points during the project period. A survey assessment on diabetes-related behaviors and attitudes will be conducted with a sample of the participants at baseline, mid-point, and final. Initial findings suggest that the micro-clinic model has the potential to effectively address the rampant diabetes epidemic in Jordan and potentially throughout other under-served communities globally.

No conflict of interest

ORAL PRESENTATION

FOUNDATION SCIENCE

Diabetes and obesity-predisposing genes

O-0227

Genome wide and candidate gene studies of African American type 2 diabetes

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Over 3.2 million African Americans have type 2 diabetes (T2DM). This represents approximately 13.3% of the African American population and a significant proportion of the 20.8 million Americans believed to be living with diabetes. On average, an African American is twice as likely to have T2DM as a European American peer.

Aims/methods: In order to gain insights into the genetic contributions to T2DM in African Americans we have carried out both gene-targeted and Genome Wide Association Studies (GWAS) in samples of T2DM-affected cases and non-diabetic controls recruited from the southeastern portion of the United States.

Results: Taking advantage of the LD structure of African-derived chromosomes, we have localized TCF7L2 association with T2DM to a 4kb LD block. With resequencing of 96 African American DNAs in this block we identified 35 novel and 14 known SNPs which were genotyped in 1033 cases and 1106 controls along with the SSTR marker DG10S478. SNP rs7903146 was by far the most strongly associated (admixture adjusted, additive $P=1.59x10^{-6}$; OR 1.39) suggesting this is a functional polymorphism. Admixture in these samples has been evaluated by genotyping 70 Ancestry Informative Markers in all samples. In contrast to TCF7L2, other SNPs associated with T2DM in European-derived samples showed little or no evidence of association with T2DM even in an enlarged sample of 2841 cases and 1964 controls. Only SNPs in CDKAL1 showed even modest evidence of association (P-values 0.06-0.07). Evaluation of these SNPs in the Human Genome Diversity Panel, however, suggests some of these SNPs may be fixed in the African population since Yoruba are monomorphic for the risk allele observed in Europeans.

We have carried out a GWAS analysis on 966 cases and 1033 controls using the Affymetrix 6.0 chip. After extensive quality control 835,042 SNPs were evaluated in admixture-adjusted association analysis focusing on the additive model. Approximately 40 SNPs had P-values $< 10^{-6}$. In addition, SNPs in two previously identified T2DM genes from studies of European-derived populations were among the top hits. SNPs rs17703228 ($P=7.42x10^{-5}$) in "juxtaposed with another zinc finger gene 1" (***JAZF1***) and rs10906180 ($P=6.38x10^{-5}$) in the calcium calmodulin-dependent protein kinase 1D (***CAMK1D***) were associated with T2DM in African Americans. These SNPs are different from SNPs previously observed to be associated with T2DM in Europeans. Replication studies of African American SNPs are underway in a two stage replication analysis totaling over 4,000 cases and 4,000 controls, and evaluation of imputed SNPs and copy number variation is also in progress.

Discussion: While some elements of diabetes risk in African Americans are similar to those in European-derived populations, clear differences are observed that will be of great interest for future investigation.

No conflict of interest

O-0228

Genetic admixture effect on type 2 diabetes mellitus, in a sample in North West Colombia

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Aims: Admixture mapping is a recently developed method for identifying genetic risk factors involved in complex traits or diseases showing prevalence differences between major continental groups. Type 2 diabetes (DM2) is at least twice as prevalent in Native American populations as in populations of European ancestry, so admixture mapping is well suited to study the genetic basis of this complex disease.

We assessed the effect of the Amerindian background and its effect on prevalence and risk of DM2, in the population of Antioquia (Colombia) which has a tri ethnic admixture.

Methods: We have characterized the admixture proportions in a sample of an Antioquia population by genotyping 75 autosomal Ancestry Informative Markers, in 582 persons with type 2 diabetes and 267 healthy individual. We assessed the effect of population stratification by comparing the genetic background between cases and controls and analyzed the implications of the results on diabetes type 2.

Results: The test for residual allelic association between unlinked loci yielded posterior predictive check probabilities of 0.0, 0.42, and 0.47 with models based on 1, 2, and 3 subpopulations, respectively. So, There is no evidence for residual stratification. Therefore, in the sample from Antioquia a model with two subpopulations was adequate to account for residual allelic associations. The effective number of generations back to unadmixed ancestors, under a model of admixture occurring at a single pulse was 11 per morgan, with (95% CI) 95% confidence interval (9 - 13.3).

The average proportions of European, African and Native-American admixture were estimated as 0.58, 0.12 and 0.29 for cases and 0.62, 0.11, 0.26 for controls, respectively. The maternal lineages were estimated as 88% Native-American and 6.3% African for cases and 90% and 4.8% for controls respectively. In a logistic model with diabetes as dependent variable, the odds ratio associated with unit increase in Native American admixture proportion (from 0 to 1) was estimated as 5.31 with a 95%CI (1.94 – 14.73), and for African admixture was 3.86, with a 95%CI (1.24 – 12.67). After correcting with income the OR of African ancestry was 2.38 with 95%CI (0.78 - 8.24)

Discussion and conclusion: We observed a significant association of Amerindian ancestry with Diabetes before and after correcting with age, sex and income. Our findings reinforce the importance of admixed populations as a useful resource for mapping traits with different prevalence between two parental populations as well as the assessment of the effects of stratification as a critical factor to appropriately interpret the results of case-control studies in admixed populations

No conflict of interest

O-0229

Interaction between PON1 Gln192Arg polymorphism and type 2 diabetes in Indo-Mauritian agricultural workers exposed to herbicides

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Aims: Type 2 diabetes (T2D) is a multifactorial disorder where age, genetic factors and environment play a role. Human serum paraoxonase (PON1) is an enzyme located on HDL-cholesterol that is involved in prevention of LDL-cholesterol peroxidation and in detoxification of organophosphate (OP) pesticides. A previous cross-sectional study on 73 agricultural workers exposed to insecticides had shown a borderline association between the PON1 Gln192Arg polymorphism and T2D, p=0.05. The present study was carried out to confirm association between the polymorphism and T2D in agricultural workers exposed to herbicides.

Methods: After ethical clearance was obtained, and informed consent was provided for genetic studies by 157 male agricultural workers of Indo-Mauritian origin exposed to herbicides, glucose metabolism status and lipid profile were studied in a fasting state, with anthropometric and blood pressure measurements on the same day. PON1Gln192Arg genotyping was performed, blind to phenotype, using PCR-RFLP techniques. Genotype data in present cross-sectional study was compared with data available from 193 male agricultural workers of same ethnic origin, involved in genetic studies on T2D, who were not exposed to herbicides. A p-value = 0.05 was considered to be significant.
Results: Prevalence of T2D (19%) was as expected for Mauritian men of similar age. Allelic frequencies (p=0.017) and genotype proportions (p=0.019) were different between diabetic and non diabetic agricultural workers exposed to herbicides. Diabetic sprayermen were more often homozygous for the Gln192 allele (50%, n=30) than non-diabetic sprayermen (24.4%, n=122), OR=3.10, Cornfield 95% CI: 1.36<OR<7.14, p=0.01. In the non exposed group, no difference was found in allelic or genotypic proportions between diabetic and non diabetic agricultural workers. Genotype proportions were different between hypertensive and normotensive workers, hypertensive workers in the exposed group were more often homozygous for the Arg192 allele (32.2%, n=59) than non hypertensive workers (10.2%, n=98), OR=4.18, Cornfield 95% CI: 1.78<OR<9.80, p=0.001. The same trend was found in the unexposed group: 26.6% of 64 hypertensive v/s 14% of 129 normotensive men, OR=2.23, Cornfield 95% CI: 1.06-4.70, p=0.05.
Discussion/conclusion: We found an interaction between occupational exposure to herbicides and the PON1 Gln192Arg polymorphism on prevalence of type 2 diabetes in Indo-Mauritian men, Gln192 allele being associated with T2D when there was exposure to herbicides. Indo-Mauritian men were also more often hypertensive when they were homozygous for the alternate Arg192 allele, irrespective of occupational exposure to herbicides.

No conflict of interest

O-0230

The HNF1A G319S variant is associated with C-reactive protein in an Aboriginal population

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Aims: Common variants of the hepatocyte nuclear factor 1A (HNF1A) gene encoding HNF-1a have been associated with plasma C-reactive protein (CRP) concentration, which is elevated among individuals with diabetes and metabolic abnormalities. HNF-1 binding to promoter regions of the CRP gene is known to be involved in regulation of CRP synthesis in the liver. A glycine to serine substitution at codon 319 (G319S) of the HNF1A gene has been identified and linked with increased risk for type 2 diabetes - not maturity-onset-diabetes-of-the-young - in a Canadian First Nations population. The aim of this study was to determine the association between the HNF1A G319S variant and plasma CRP among individuals with and without type 2 diabetes.
Methods: Between 1993 and 1995, 728 members of Sandy Lake First Nation participated in a diabetes prevalence and risk factor survey. Fasting glucose and a 75-g oral glucose tolerance test were obtained to determine type 2 diabetes, according to the 1998 World Health Organization criteria. Participants were genotyped for the HNF1A G319S mutation. Fasting blood samples were analyzed for CRP, interleukin (IL)-6, and serum lipids. Interviewers administered questionnaires to obtain demographic and medical history information. Anthropometry and blood pressure were measured.
Results: The prevalence rates of type 2 diabetes were 14.0% (77/550) in homozygous G319, 29.2% (42/144) in heterozygous, and 83.3% (5/6) in homozygous S319 carriers (p<0.001). Under a dominant model, least squares mean CRP levels were higher among the homozygous G319 carriers (1.90 [95% confidence interval 1.55-2.33] mg/l) compared to S319 allele carriers (1.37 [1.12-1.68] mg/l) (p=0.0016), after adjustment for age, sex, hypertension, triglyceride, waist circumference, HDL cholesterol, 2-h postload glucose, and IL-6. When participants were stratified by diabetes status, CRP remained strongly associated with the G319S mutation among people without type 2 diabetes (1.66 [1.33-2.08] mg/l in homozygous G319 vs. 1.18 [0.95-1.48] mg/l in S319 allele carriers, p=0.0030) with similar adjustment. Among participants with diabetes, the CRP levels were elevated in both S319 allele carriers and non-carriers. The association between the G319S variant and CRP was not statistically significant among individuals with diabetes potentially due to the small sample size (4.90 [3.12-7.71] mg/l in homozygous G319 vs. 3.76 [2.39-5.91] mg/l in S319 allele carriers, p=0.25). There was no sex or age interaction with HNF1A G319S variant on plasma CRP levels (p>0.5).
Conclusion: We conclude that the HNF1A G319S variant, which is clearly dysfunctional and a risk marker of type 2 diabetes, is also associated with variation in CRP levels in this population, supporting a mechanistic relationship between HNF1A and plasma CRP.

No conflict of interest

O-0231

Novel obesity risk loci do not determine distribution of fat depots: a whole body MRI/MRS study

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Background and aim: A recent metaanalysis of the genome-wide association studies (GWAS) have identified six new risk loci for common obesity (TMEM18, KCTD15, GNPDA2, SH2B1, MTCH2 and NEGR1). The effect of these new risk loci on BMI ranged per allele from 0.06-0.26 kg/m2. For most of these gene variants an increase in fat mass is shown, but it is so far unknown if these new risk loci for common obesity have an influence on distribution of fat depots.
Material and methods: We therefore genotyped 1524 non-diabetic subjects for the aforementioned SNPs ((TMEM18 (rs6548238), KCTD15 (rs11084753), GNPDA2 (rs10938397), SH2B1 (rs7498665), MTCH2 (rs10838738) and NEGR1 (rs2815752)). We assessed BMI, waist circumference, total body fat (bioimpedance) and lean body mass (bioimpedance). All subjects underwent an oral glucose tolerance test with determination of insulin sensitivity and insulin secretion. In a subcohort of 343 subjects we measured body composition (total adipose tissue, visceral adipose tissue, non-visceral adipose tissue, liver fat content and intramyocellular lipids) using whole body magnetic resonance imaging (MRI) and spectroscopy (MRS).
Results: After appropriate adjustment for confounding variables and Bonferroni correction for multiple comparisons (corrected alpha-level: p = 0.0085), none of the SNP was significantly associated with BMI, waist circumference, lean body mass (bioimpedance), total adipose tissue, visceral adipose tissue, non-visceral adipose tissue, liver fat content and intramyocellular lipids (all p > or = 0.01, dominant inheritance model).
The risk alleles of TMEM18 rs6548238, NEGR1 rs2815752 and MTCH2 rs10838738 tended to associate in our cohort with higher BMI (all p=0.03) and the risk allele of TMEM18 rs6548238 in addition with higher waist and total body fat (bioimpedance) (p=0.02 and p=0.03). In the MR cohort, we found a nominal association of the risk allele of SH2B1 SNP rs7498665 with higher visceral adipose tissue (p=0.02). In addition, the risk allele of GNPDA2 SNP rs10938397 tended to associate with an increase in total adipose tissue (p=0.05) and non-visceral adipose tissue (p=0.07). The study was sufficiently powered (1-beta = 0.8) to detect effect sizes between 16.9-18.0 % and in the MR cohort between 35.4% and 39.5 %.
Conclusion: In contrast to the risk allele loci in RARRES2 and MC4R, we could not detect significant associations of the novel risk loci on differential distribution of fat depots. Possible weak effects of TMEM18 rs6548238, SH2B1 SNP rs7498665 and GNPDA2 SNP rs10938397 on body composition await further confirmation by larger studies.

No conflict of interest

O-0232

Effect of Cd36 deficiency on carbohydrate and lipid metabolism is contextually determined by genomic background and reflected in transcriptomic profile

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Aims: Deficiency of fatty acid translocase Cd36 has been shown to play major role in pathogenesis of metabolic syndrome in spontaneously hypertensive rat (SHR). We have tested the hypothesis that its effects on metabolism and genome-wide transcription profile are contextual with genomic background.
Methods: We have derived 4 new congenic strains: 2 BN-Lx.SHR4 and 2 PD.SHR4 by introgression of chromosome (chr.) 4 region of SHR origin including defective Cd36 gene into genetic background of highly inbred models of insulin resistance and dyslipidemia, PD and BN-Lx strains, respectively. We have compared the metabolic profile of BN-Lx.SHR4 congenic strains under standard diet conditions and after 3-day administration of dexamethasone to that of progenitor strains BN-Lx and SHR (n=6 adult males/strain).We have subjected standard diet-fed adult males of PD and PD.SHR4 strains (n=8/strain) to metabolic, morphometric and transcriptomic (Affymetrix Rat 1.0 ST Exon array) profiling.
Results: The BN-Lx.SHR4 strains showed markedly blunted reaction to diabetogenic action of dexamethasone compared both to BN-Lx and SHR. We observed significantly improved glucose tolerance and lower fasting insulin in both PD.SHR4 strains compared to PD. In contrast, one of the PD.SHR4 strains showed highest concentrations of LDL cholesterol compared both to PD and the other PD.SHR4 congenic. Both PD.SHR4 strains had smaller LDL particle sizes and lower HDL cholesterol than PD. The expression profile revealed systematic dysregulation of transcription around insulin gene network node and in number of genes constituting circadian rhythmicity pathway (Arntl, Clock, Nfil3, PER2 and PER3) in PD.SHR4.
Discussion/conclusion: The introduction of chr.4 region of SHR origin including defective Cd36 into BN-Lx and PD genetic backgrounds resulted in disconnected changes in metabolic profile and its reaction to pharmacological challenge. The eventual phenotypic outcome of deleterious mutation is thus a function of complex interactions between environment and genomic background, upon which it operates.

No conflict of interest

O-0233

Control of insulin storage and secretion by the type 2 diabetes associated granular zinc transporter, ZnT8 (SLC30A8)

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Background and aims: The accumulation of zinc ions into secretory granules is believed to be essential for the formation of hexameric insulin and, ultimately, of insulin crystals and granule dense cores. Correspondingly, a non-synonymous single nucleotide polymorphism rs13266634 in the SLC30A8 gene, encoding the secretory granule zinc transporter ZnT8, has been shown recently to be associated with an increased risk of type 2 diabetes. Here, we describe the effects of deleting ZnT8 gene in mice and a likely molecular mechanism of action of at risk allele.
Methods: Three separate mouse colonies of mice deleted for exon one of the slc30a8 gene were maintained on standard chow on a mixed sv129/C57BL/6 background. Glucose and insulin tolerance were measured by intraperitoneal injection of glucose or euglycemic clamp, respectively. Insulin secretion assay, electrophysiology and imaging techniques, as well as the generation of plasmid vectors and adenoviruses encoding the normal (W325) or elevated-risk (R325) allele of ZnT8, were undertaken using standard protocols.
Results: Abnormal glucose tolerance was apparent in male $ZnT8^{-/-}$ mice from six weeks of age. Whereas in vivo insulin sensitivity was unaltered, islets isolated from knockout mice displayed reduced granule zinc content and abnormal granule morphology with the appearance of atypical, rod-like granules, but normal insulin processing. Glucose or KCl-stimulated insulin secretion were significantly decreased in the absence of the transporter, and the proportion of secretory events leading to complete cargo depletion, as assessed by total internal reflection of fluorescence, was diminished. Molecular modelling based on the bacterial ZnT8 homologue YiiP revealed that the polymorphic residue 325 was located at the interface between ZnT8 monomers in the dimeric transporter and thus likely to impact on the interaction with metallochaperones. Correspondingly, when over-expressed in clonal MIN6 ß-cells, R325 ZnT8 displayed lower apparent Zn^{2+} transport activity than the R325 form of the transporter.
Discussion and conclusions: ZnT8 is required for the normal uptake of zinc ions into insulin granules and normal insulin storage. Reduced zinc accumulation into granules, and defective insulin storage, in carriers of the R allele may contribute to increased risk of type 2 diabetes.

No conflict of interest

O-0234

Insulin secretion from the INS-1 832/13 ß-cell line is influenced by melatonin receptor signaling

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Aims: Several genetic studies have implicated melatonin receptor 1B (MTNR1B) as a new candidate gene associated with the pathogenesis of Type 2 Diabetes Mellitus (T2DM). In mammals, its ligand, the pineal hormone melatonin, binds primarily to its two receptors, MTNR1A and MTNR1B, which are G-protein coupled receptors, and are proposed to exert an inhibitory effect on insulin secretion. It remains uncertain, however, which receptor mediates this effect and to what extent. Therefore, we investigated the effect of MTNR1A/B signaling on glucose-stimulated insulin secretion (GSIS). Also, this study aimed at providing information about whether melatonin is endogenously produced in the pancreatic ß-cell and thus may exert autocrine effects on insulin secretion.
Methods: We knocked down MTNR1A and MTNR1B in the INS-1 832/13 ß-cell line by RNA interference. The transfected cells were then stimulated with glucose alone or in combination with the cAMP raising agent forskolin, given the suggested cAMP-lowering effect of melatonin. Gene expression was measured by Q-PCR for MTNR1A/B and arylalkylamine-N-acetyl transferase (AANAT), the rate limiting enzyme in melatonin biosynthesis.
Results: On the mRNA level both MTNR1A and MTNR1B were successfully knocked down by ~80% (n = 3). Insulin secretion, by stimulation with only glucose, was not affected by knock down of MTNR1B but showed a trend towards an inhibition when MTNR1A was silenced. To induce K_{ATP}-independent insulin secretion, INS-1 832/13 ß-cells were stimulated with 16.7 mM glucose in combination with 35 mM potassium and 250 µM diazoxide. A similar pattern as for stimulation with glucose alone was observed after knock down of either receptor. Stimulation with 16.7 mM glucose in combination with 2.5 µM forskolin evoked a 3-fold increase in GSIS compared to stimulation by 16.7 mM glucose alone. In contrast, knock down of MTNR1A significantly inhibited GSIS under these conditions (90 ± 10 vs 186 ± 51 ng/mg/h; $p = 0.03$, $n = 3$). MTNR1B silencing did not show a significant inhibition of insulin secretion under the same conditions. Furthermore, mRNA of the enzyme AANAT, active in melatonin synthesis, was expressed in INS-1 832/13 ß-cells.
Conclusion: We found that blocking melatonin receptor signaling in INS-1 832/13 ß-cells, particularly that of MTNR1A, decreases the insulin secretory response, foremost that potentiated by cAMP. We demonstrate expression of AANAT, the rate-limiting biosynthetic enzyme, in INS-1 832/13 ß-cells, which suggests that endogenous production of melatonin occurs in these cells. Our data suggest that melatonin receptor signaling is involved in control of insulin secretion and that the involvement of endogenous melatonin may play a role in these processes.

No conflict of interest

ORAL PRESENTATION

HEALTHCARE AND EPIDEMIOLOGY

Diabetes in indigenous populations

O-0235

Epidemiology of diabetes in Saskatchewan adults from 1980 - 2005: a comparison of first nations people and other Saskatchewan residents

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The purpose of this research was to investigate the epidemiology of diabetes in Saskatchewan from 1980 to 2005, and compare differences between First Nations people (FN) and other Saskatchewan residents (OSK).
This was a population based study of diabetes (>90% type 2 diabetes) in the total annual Saskatchewan populations of FN and OSK. Using Government of Saskatchewan administrative databases, people with diabetes were identified using an algorithm adapted from the National Diabetes Surveillance System. Diabetes frequency, incidence and prevalence were compared by year, age, sex and ethnicity.
We identified 90,578 incident cases of diabetes in Saskatchewan adults ≥ 20 years from 1980-2005. Of these 82,304 were OSK (55% males) and 8,274 were FN (45% males). Overall, FN women had the highest diabetes incidence and prevalence while OSK females had the lowest rates. Diabetes incidence and prevalence were > 4 times higher in FN compared to OSK women and > 2.5 times higher in FN compared to OSK men. Diabetes incident cases peaked in both FN males and females aged 40-49 while most OSK cases occurred in those aged 70+. There were more diabetes cases in FN females than males particularly during reproductive years, and more diabetes cases in OSK males than females particularly during middle age and older. Over the study period, diabetes prevalence more than doubled in FN females (9.51% to 20.33%) and more than tripled in FN males (4.91% to 16.01%). Diabetes prevalence consistently remained > 4% higher in absolute terms among FN women than FN men. Although diabetes prevalence was lower in OSK, the rates of increase were similar, rising from 2.01% to 5.51% among females and from 2.01% to 6.24% among males. By 2005, almost 50% of FN females and over 40% of FN males aged 60+ had diabetes, while it affected less than 25% of OSK males and less than 20% of OSK females aged 80+.
This study shows marked differences in the demographics of diabetes between FN and non-FN over the longest period reported for a Canadian jurisdiction. Furthermore, within the observed epidemic of diabetes among FN, women were disproportionately affected due to an excessive burden of diabetes particularly during reproductive years. These findings have implications with respect to understanding diabetes risk factors, planning and implementation of prevention and clinical management initiatives, and anticipation of future health care resource needs.

No conflict of interest

O-0236

Mobile diabetes telemedicine clinic (mdtc): role in first nations care and treatment

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Aims: To describe baseline characteristics and clinical outcomes among clients of a program to improve diabetes care for residents of Aboriginal communities in northern British Columbia, Canada.
Study design: Longitudinal cohort.
Methods: Since 2002, the MDTC serves about 51 communities whose small size and geographic remoteness impede access to specialized diabetes care. A nurse and a visual technician travel to reserves, offering people with diabetes comprehensive annual assessment: history, physical exam, point-of-care lab (A1c, FBG, lipids: TC, HDL, LDL and TG, microalbumin:creatinine ratio (MCR)), and retinal fundus photography. Reports generated from computerized data are transmitted to Endocrinology and Ophthalmology consultants who review and correct and then return reports to community health workers and primary care physicians for action. Physicians get specific recommendations on glycemic, hypertensive, lipid and renal protective therapy. Patients get advice on lifestyle changes and avoidance of complications.
Results: During the 6-year period 2003-2009, the MDTC performed 1,221 assessments on 750 people with T2DM (458 attended once, 173 twice, 80 three times, 23 four times, 11 five times and 5 six times). At first visit: 80% ≥ 50 years old, 24% were 70 or older, 54% female, 50% with duration of DM ≥ 5 years, 74% had BMI ≥30, 64% had BMI ≥35, 65% on oral agents (59% Met, 26% SU, 7% TZD), 15% on insulin. 51% on ACEI/ARB, 34% on other antihypertensive, 26% on a statin, 61% were hypertensive (systolic ≥130 or diastolic ≥80 mmHg), 44% had A1c ≥7.0%, 37% had A1c ≥7.5%, 36% had HDL<1.0 mmol/L, 62% had LDL ≥2.0 mmol/L, 49% had TG≥2.0 mmol/L, 43% had TC:HDL ratio ≥4.0, 29% of women had MCR ≥2.8, 41% of men had MCR=2.0. At subsequent assessments: mean time since previous assessment was 1.7 years, mean decline in body mass was 1.6 kg (95% CI: 0.6 to 2.6 kg), mean decline in LDL was 0.3 mmol/L (95%CI: 0.2 to 0.4 mmol/L). Mean changes in physical activity, blood pressure, FBG, A1c, HDL, TG, TC:HDL ratio and MCR were not statistically significant. However, among clients who returned for second assessment less than 1.5 years later, mean absolute decline in A1c was 0.4% (95%CI: 0.1% to 0.6%). Frequency of hypoglycemic episodes declined with successive visits. Prevalence of ACEI/ARB use increased from 47% at baseline to 73% at fourth or later visits (p<0.0005). Prevalence of statin use increased from 26% at baseline to 48% at fourth or later visits (p=0.002).
Conclusion: The MDTC led to modest improvement in some clinical outcomes. Outcomes were adversely affected by delay in follow-up visits. Effectiveness could be enhanced by increased frequency of contact with clients, and additional supports and education between annual assessments.

No conflict of interest

O-0237

Burden of type 2 diabetes-associated complications in Canada's First Nations peoples in 2007: the CIRCLE study

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Introduction and aim: First Nations (FN) peoples in Canada suffer from high prevalence rates of type 2 diabetes mellitus (DM). Remarkably little national data are available on DM-associated morbidity in this population. The aim of the Canadian First Nations Diabetes Clinical Management Epidemiologic (CIRCLE) study was to examine the clinical parameters of DM and complications burden.
Methods: Medical charts of consenting DM patients (>=18y) of FN descent from 15 FN communities were randomly audited for DM care in 2007. Metabolic status, prevalence of complications and treatment were documented through a systematic computerized data collection methodology.
Results: Cross-sectional data were analyzed from 733 charts; 63.7% were female, mean age was 54.0y, mean duration of DM was 9.8y, and mean A1C was 8.0%. Of the 672 patients with available data on smoking status, 39.4% currently smoked. The percent of patients with a BMI over 25 was 80.3%. On average, patients were diagnosed with 5.2 comorbidities /complications.
Duration of DM was significantly associated with increasing number of comorbidities/complications (p<.0001) as well as increasing A1C (p<.05) using linear regression analysis. The table provides the overall comorbidity/complication prevalence rates. The most common comorbidities/complications were hypertension (58.3%), dyslipidemia (39.0%) and chronic kidney disease/dialysis (24.3%). Nearly half of the patients (43.9%) had one or more microvascular complication while 18.8% were diagnosed with one or more macrovascular complication. Using multivariate logistic regression analysis controlling for covariates, DM duration was found to be significantly associated with the most number of comorbidities/complications, including: hypertension (odds ratio 1.1[95% CI 1.1-1.2], p<.05), cerebrovascular disease and stroke (1.1[1.0-1.2], p<.05), neuropathy (1.1[1.1-1.2], p<.0001), retinopathy

(1.3[1.2-1.5], p<.0001), and amputation (1.9[1.3-2.8], p<.01).

Comorbidities /Complications	Prevalence %
Hypertension	58.3
Dyslipidemia	39.0
CVD	18.8
CAD, MI & Heart Attack	12.4
Cerebrovascular Disease & Stroke	5.5
Microvascular Complications	43.9
Chronic Kidney Disease & Dialysis	24.3
Neuropathy	11.5
Diabetic Retinopathy	10.5
Amputation	6.3
Depression	10.6

Discussion: FN peoples in Canada have poor glycemic control, high rates of smoking, and high rates of comorbidities/complications, particularly hypertension, dyslipidemia, and kidney disease/dialysis. These rates increase with duration of DM. Microvascular complications pose a large burden. The impact of DM on cardiovascular disease in this population may not have been fully expressed but the high rates of cardiovascular risk factors highlight the imperative need for risk factor intervention and complications surveillance.

No conflict of interest

O-0238

Ethnic and province specific prevalence of diabetes mellitus in Sri Lanka – Sri Lanka Diabetes and Cardiovascular Study

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Introduction: The prevalence of diabetes among Sri Lankan adults has been recently reported as 10.3%. We aimed to determine the prevalence of diabetes and the underlying risk factors among different ethnic groups and provinces.
Methods: 5000 subjects above 18 years of age were selected by a multi-stage random cluster sampling technique. A structured questionnaire was used to record interview and anthropometric data. Fasting and 2-hour post OGTT plasma glucose were estimated. New cases of diabetes were diagnosed according to the WHO criteria. Data analysed using STATA software.
Results: Altogether 4532 subjects participated (response 91%); males 40%; mean age 46years (SD 15). The crude prevalence of diabetes was 12.6%. The prevalence of diabetes was highest in the Western province (18.8%) followed by Central (12.6%), Southern (12.2%) Sabaragamuwa (11.5%), North-Western (10.0%) and Uva (6.8%) provinces (p<0.0001). Sri Lankan Tamils (22.1%) had the highest prevalence of diabetes followed by the Muslims (21.4%), Sinhalese (11.9%) and Plantation sector Tamils (3.2%) (<0.022). Ethnicity was not significantly associated with diabetes in multivariate regression analysis corrected for obesity and physical inactivity but the province of residence remained significantly associated. In different provinces and ethnic groups, diabetes prevalence positively correlated with obesity indices and income but negatively correlated with level of physical activity.
Conclusion: There is a marked variation in the prevalence of diabetes in different provinces and ethnic groups in Sri Lanka. These patterns underlie the differences in obesity, income and physical activity and can be used for targeted primary preventive strategies.

No conflict of interest

O-0239

Type 2 diabetes and growth patterns of offspring of mothers with early-onset type 2 diabetes in indigenous peoples in Manitoba, Canada: the Next Generation Project

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Aims: The incidence of type 2 diabetes (T2D) in First Nations children is 20-fold higher in Manitoba compared to other Canadian provinces. Genetic predisposition due to a private polymorphism and maternal pre-pregnancy T2D appear to be non modifiable risk factors for developing T2D in indigenous peoples in Manitoba. The Next Generation Project is a birth cohort of those children born to mothers who had pre-pregnancy T2D diagnosed before 18 years in Manitoba. The Canadian Diabetes Association 2008 guidelines recommend screening for diabetes in at risk children ≥ 10 years of age at least every two years. The objectives are to assess the childhood growth patterns, provide surveillance for T2D in those children ≥ 7 years of age, and to reconsider the validity of screening guidelines for T2D in children of this population.
Methods: Annual heights and weights are recorded and a fasting blood glucose is measured in offspring ≥ 7 years of age.
Results: On December 31, 2008, 40/78 (51%) offspring had completed their 2008 assessment. 100% of the boys, and 68% of the girls ≥2 years of age were overweight or obese. 8/35 (23%) of the offspring ≥7 years of age have T2D. 44% of the offspring ≥ 10 years of age have T2D. 2/8 (25%) of these were diagnosed before the age of 10. All of the 8 children with T2D have one or two copies of the private Oji-Cree HNF1-a G319S polymorphism, associated with a mild insulin secretory defect.
Conclusion: Overweight and obesity are modifiable risk factors for age of onset of diabetes. The high risk genotype and maternal pre-pregnancy T2D in Oji-Cree peoples are non-modifiable risk factors for T2D. The guidelines for diabetes screening need to be customized for this high risk population. Our results inform the design of potential prevention programs.

No conflict of interest

O-0240

The emergence of diabetes mellitus as a health problem among Brazilian Xavante Indians

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Background: Originally diabetes mellitus was rare among native Americans but change to a high risk group when they adopt life style of Western societies. This situation is now being observed among some Brazilian Indians, particularly the Xavante, who live in the scrubland of Central Brazil.
Objective: To estimate the prevalence of diabetes, obesity and hypertension in the adult Xavante population.
Methods: The Xavante population were brought by catholic priests to the Sangradouro reservation in 1957, located in the North of the State of Mato Grosso, when they were in conflict with farmers. Presently, the population is composed by 1549 individuals (829 men and 720 women), with 612 (38.5%) Indians aged 20 years or more. They have important changes in their traditional life style, with incorporation of industrialized foods, rice, sugar, soft drinks and some alcohol. The survey was based on a 75g glucose tolerance test and capillary glycemia measured by HemoCue. All participants signed an informed consent form.
Results: From the population aged 20 years or more, 351 Indians (57.4 % of the target age-group) underwent anthropometric and clinical examinations. Using WHO criteria, diabetes was diagnosed in 74 (21.1%), and IGT in 108 (30.8%) individuals. The prevalence of hypertension was 9.7% and the rates for obesity (BMI >or = 30 kg/m^2) and overweight (BMI > or = 25 and < 30 kg/m^2) were 44.7% and 37.9%, respectively. A large proportion (50%) of those with previously diagnosed diabetes was on insulin therapy, because of the poor response to oral anti-diabetic drugs.
Conclusion: These results show that diabetes and obesity are now an important health problem for the Xavante population. The increasing prevalence of DM and the perspective of occurrence chronic diabetic complications in an area with lack of health care tend to worsening their health conditions.

No conflict of interest

O-0241

Serum 25 (OH) D has no effect on insulin resistance among normoglycemic Cree

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Aims: Recent studies have linked vitamin D insufficiency with an increased risk of insulin resistance and diabetes. As vitamin D insufficiency is widespread in North America and a readily modifiable risk factor, we examined the relationship between serum 25 (OH) D concentrations and subclinical insulin resistance in the James Bay Cree, a population in which insulin resistance and type 2 diabetes have reached epidemic proportions.
Methods: A cross-sectional health survey was conducted of randomly selected adults and children from three Northern Québec, James Bay Cree communities surveyed in the summer months of 2005-2007. A total of 328 adult participants (>18 years of age) had serum 25 (OH) D, anthropometric measures and fasting glucose and insulin available for analyses.
Results: A high degree of insulin resistance as measured by homeostatic model assessment (HOMA-IR) was identified with mean HOMA-IR of 4.4 (0.6-23.4) and 10.0 (1.4–79.6) observed for those without and with glucose intolerance based on a fasting plasma glucose cut-off value of 5.6 mmol/L. The majority (91%) of the sampled population was vitamin D insufficient based on serum 25 (OH) D concentrations falling below 75 nmol/L, and nearly half of the population (46%) was deficient or severely deficient (< 50 nmol/L). Serum vitamin D concentrations were negatively and significantly correlated with measures of adiposity such as waist circumference (r = -0.124), BMI (r = -0.201), total fat mass (r= -0.249) and percent body fat (r = -0.264) (all p-values < 0.01). In multivariable linear regression analyses restricted to normoglycemic participants and adjusted for age, sex, BMI, and waist circumference, there was no relationship between serum 25 (OH) D and HOMA-IR (Beta = 0.003, SE= 0.019, p-value=0.86).
Conclusions: The inverse relationship between serum 25 (OH) D and adiposity is consistent with the hypothesis that vitamin D is sequestered by adipose tissue. However, no evidence of a relationship was found between serum vitamin D concentrations and insulin resistance among normoglycemic Cree.

No conflict of interest

ORAL PRESENTATION

Quality assurance and clinical application of guidelines

O-0242

Healthcare utilization patterns in diabetes mellitus in 1991 and 2007 - A Swedish Population-Based Study

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Aims: During the past decade, the general assumption has been that diabetes care has developed towards improved quality and cost-effectiveness. There is, however, little information on changes over time in healthcare utilization patterns and in the excess need and use of services. The aim of this study is to compare healthcare utilization in patients diagnosed 1983 and followed-up 1991 and in patients diagnosed 1999 and followed-up 2008, i.e. with eight years' duration of diabetes, with the general population. The diabetic population was chosen as their diabetes was expected to be in a relatively stable phase, yet long-term complications might start to affect the utilization patterns.
Methods: Since 1983, the Diabetes Incidence Study in Sweden, DISS, prospectively registers all incident cases of diabetes in the age group 15 to 34 years, approximately 400 cases per year. In 1991 and 2007, population-based case-control studies were performed following up incident cases diagnosed eight years earlier, i.e. 1983 and 1999 respectively. For each case, two age- and sex-matched controls were selected from the general population. Retrospective data about utilization patterns in 2007 were collected using a mailed questionnaire, returned by 199 (49%) patients with diabetes and 368 (45%) controls. Comparable data were available from 1991 on the cohort registered in 1983 (n=317, response rate 72%) and corresponding control group (n=586, response rate 68%).
Results: In the group who contracted diabetes in 1999, 87% had insulin treated diabetes compared to 89% in the group diagnosed in 1983. In 2007, at least one visit to a hospital outpatient department, excl. emergency rooms was reported by 69% of the cases and 24% of the controls (p<0.001). Visit at an emergency room was reported by 11% of the cases and 6% of the controls (p<0.05). In 1991, the corresponding figures for outpatient department were 73% and 17% (p<0.001) and for emergency room visits 9% and 7% (n.s.), respectively. Staying at hospital inpatient department during the past year was in 2007 reported by 12% of the cases and 6% of the controls (p<0.05). Corresponding figures in 1991 were 18% and 9% (p<0.05) respectively. Use of services at hospital day care units was in 2007 reported by 43% of the cases and 14% of the controls (p<0.001), while the figures in 1991 were 13% and 5% respectively (p<0.05).
Conclusions: In the diabetic population, there was a higher excess use of day care services in 2007 than 1991. The use of inpatient care had decreased in both the diabetic and control groups. Yet, there was a significant excess use of inpatient care in diabetes also in 2007. The excess use of emergency care in 2007 calls for further investigations.

No conflict of interest

O-0243

Root causes of clinical inertia in diabetes care

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Aims: Failure to intensify therapy, which is an error of omission, is a leading cause of failure to reach evidence-based diabetes care goals. In this report we quantify provider, care system, and patient reasons for failure to appropriately intensify glucose medications.
Methods: As part of a larger study, 19 primary care physicians using an EMR-based clinical decision support tool completed a visit action resolution (VAR) form at each visit involving selection from a checklist of possible reasons why diabetes treatment was not intensified at office visits when patients with diabetes were not at recommended clinical goals.
Results: EMR decision support was used and VAR completed at 831 of 1639 (51%) visits with elevated glycated hemoglobin (A1c >= 7%); glucose medications were not intensified at 258 (43%) of the 831 VAR completed visits. Physician-identified reasons for no treatment intensification were: (1) Patient choice or preference, 70 (19.6%), (2) Need for updated A1c, 62 (17.3%), (3) Patient of endocrinology or diabetes nurse, 53 (14.8%), (4) Addressed dietary/lifestyle changes instead, 45 (12.6%) (5) Competing clinical demands, 17 (4.7%), (6) Not my patient, 13 (3.6%) (7) addressed adherence problem, 13 (3.6%). Less frequently cited (< 2.5%) were medication regimen already too complex, hypoglycemia concerns, drug intolerance, cost concerns, advanced age or severe co-morbidities, referred to endocrinology or diabetes educator, close to goal, and other.
Conclusions: We conclude that less than 20%, of clinical inertia is attributable to patient refusal or preference. A majority of instances of clinical inertia could potentially be addressed through provider training or care system changes such as point of care A1c testing and better coordination of care with subspecialty and primary care colleagues.

Conflict of interest:
Other substantive relationships: Funding provided through United States National Institutes of Health Grant R01 DK068314. Clinical Trial Registration: clinicaltrials.gov NCT00272402.

O-0244

Decreased wait times at the Diabetes, Hypertension & Cholesterol Centre (DHCC)

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Background: The Diabetes, Hypertension & Cholesterol Centre (DHCC) is a program that serves the Calgary area, which had a total population of 1238799 in 2007. We accept 3700 referrals annually (3746 in 2008), and close to 1700 new clients are seen each year (1677 in 2008). The DHCC participated in a 14 month collaborative to measure and improve access for patients seen at the Centre. Prior to the collaborative, there was no clear measure of what wait times were at DHCC, but there was a feeling that wait times were too long. Two key areas thought to be most problematic: diabetes assessments and 24 h Ambulatory Blood Pressure Monitoring (ABPM) became the focus of this intervention.
Objectives: The AIM team set 2 objectives to improve access at DHCC:
- All new diabetes clients to be seen within 1 week, by October 31st, 2008.
- All 24 h ambulatory plood pressure monitoring (ABPM) clients to be seen within 1 week, by October 31st, 2008.

Methods: The DHCC AIM team attended a series of Learning Sessions to learn about how to measure and improve access. We began to measure the third next available (TNA) appointment, along with a number of other parameters in the Fall of 2007. The AIM team met monthly to discuss principles, and to consider and implement steps to improve access. Measurement continued for the entire period of the AIM collaborative (November 2007 to Oct 31, 2008), and continues today.
Results: In November, 2007, the third next available (TNA) appointment for a diabetes assessment was 96 days, and for a 24 h ABPM appointment was 56 days. By the week of Oct 31, 2008, after implementing several strategies, the TNA for diabetes assessments was 5 days, and for 24 h ABPM remained similar, at 42 days.
Conclusion: Measuring and taking appropriate steps to improve access provides real, measurable improvements for patients. The strategies that had the most impact on TNA for diabetes assessments were cross training of nursing and dietitian staff to increase the supply of clinicians who were able to conduct diabetes assessments, having healthcare professionals work to full scope of practice, and the use of a "short call list" to try and fill assessment spots when patients cancelled with little notice. The TNA for 24 h ABPM appointments was less improved because of lack of space and equipment to work down the backlog.

No conflict of interest

O-0245

Development of Quality Assurance for a local education delivery programme

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Background: Quality assurance (QA) is one of the four key criteria for structured education programmes identified by the Department of Health in the UK. Our local education programme for people with Type 1 diabetes is delivered at 4 different sites by 10 educators and the challenge is to ensure that it is being provided at the required standard.
Aims: To design and implement a QA process for our education programme and to ensure that the programme is delivered at the required standard and that it matches the written philosophy, aims, objectives and curriculum.
Methods: The process of QA began with ensuring baseline competencies and experiences of all educators and the establishment of an educators register. Organisational processes included mentoring, documented self and peer reflection, internal and external evaluation from observed visits and educator study days. All educators delivered at least three courses annually in order to maintain their skills and were subject to the quality assurance process yearly. Any educators who did not meet the required standard agreed further support and review.
At each QA session, educators were observed by another educator from a different site. QA tools were developed and included an assessment form completed by the observer which matched the behaviour of the educators to the written philosophy and curriculum. To assess relative participation and self reflection from group members, a timed session measured the spoken contributions from participants and educators. We aimed for the educators to be talking less than 50% of the timed session.
Peer reflection was based upon observable behaviours and interaction with group participants and included verbatim feedback with reflection. At the end of each QA session, assessors and educators worked in partnership to identify and review any learning needs and to formulate and document a professional development plan to address these. Group participants completed evaluation forms in order to inform the process.
Results: All 10 educators met the standards for competencies and experience and were entered onto the register. During the first year of the QA process, all educators successfully completed the procedure. Benchmarking between the 4 sites has shown that there are no significant differences and that the programme is being delivered as designed. Development plans are in place for all educators.
Analysis of 7 timed sessions showed that the educators met the agreed target, talking for 48% of the session. Participant feedback was used to develop the education programme.
Conclusion: A QA process has been successfully developed and delivered in 4 different sites. It is dynamic, on-going and has supported positive change for both the programme itself and the educators involved.

No conflict of interest

O-0246

The effect of predisposing complications on the 5-year incidence of diabetes complications among patients treated in Belgian multidisciplinary diabetes centers

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Aims: Prospective data obtained in real life concerning the development of complications in patients with type 1 (DM1) or type 2 (DM2) diabetes are rather scarce. The aim of the present study was to examine to what extent the presence of complications in 2002 affected the first onset of further complications during a time frame of 5 years.
Methods: Since 2001 a quality assurance project is organized in all Belgian multidisciplinary diabetes centers (n=120). Every 18 months centers collect data (demographics, blood glucose control, cardiovascular risk status, diabetes complications, self-monitoring, and drug treatment) on a cross-sectional random sample of 10% of their adult diabetes patients on >= 2 daily insulin injections and receive a personalized feedback. For the 2007 sample an overlap was induced with the 2002 sample, by using the same alphabetical start letter in the sampling procedure. Patients from both periods were matched using the center code, patient initials, month and date of birth, year of diagnosis, diabetes type, gender and height. Logistic regression was used to adjust for age, gender, diabetes duration and type.
Results: Data of both 2002 and 2007 were available for 1,531 patients. Of these, 43% had DM1 and 57% had DM2. In 2007 the median age and diabetes duration were respectively 47 and 20 years for DM1 and 70 and 17 years for DM2. The 5-year incidence of a first amputation among patients with a foot ulcer history in 2002 was 22.8%. Among patients with peripheral arterial disease (PAD) in 2002 it was 8.9%. In patients without these complications in 2002 it was below 1%. The 5-year incidence of a first foot ulcer among patients with PAD in 2002 was 10.3% and in the group with peripheral neuropathy in 2002 it was 9.1%. In patients without these complications in 2002 it was about 2%. The 5-year incidence of a first myocardial infarction (MI) and CABG/PTCA among patients with PAD in 2002 was resp. 8.7% and 16.4%. In patients without PAD in 2002 it was resp. 4.1% and 8.0%. The 5-year incidence of end stage renal disease among patients with overt nephropathy (ONP) in 2002 was 8.0%, while it was 0.8% among patients without ONP in 2002. Finally the 5-year incidence of blindness was 1.8% among patients with retinopathy (RP) in 2002, while it was 0.3% among patients without RP in 2002. The 5-year incidences of all these complications were significantly higher in patients with preceding complications in 2002, except for MI and PTCA/CABG, where age was an important determining factor.

Conclusion: This quality assurance study provides recent prospective data on the incidence of diabetes complications. The onset of complications is highly related to preceding complications. These results stress once more the importance of rapid and adequate intervention when patients start dealing with diabetes complications.

No conflict of interest

O-0247

Time to do more: Feedback based national glycaemic treatment optimization program can improve attainment of glycaemic targets

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Aim: To evaluate the impact of a 12-month glycemic treatment optimization program in 5280 men and women (mean age 60.6±11.9 years) with type 2 diabetes mellitus (T2DM) and glycated haemoglobin (A1C) above the 2003 Canadian Diabetes Association guidelines-recommended target of 6.0-7.0%.
Methods: Subjects in this registry were enrolled between March 2006 and September 2007 from the offices of 331 primary care practitioners across 9 Canadian provinces. Four clinic visits were scheduled over 12 months to monitor A1C and optimize treatment regimens.
Results: Median baseline A1C was 7.8%; IQR, 7.3% to 8.6%. The median 12-month A1C was 7.1%; IQR, 6.6% to 7.9%. Overall A1C target achievement improved between the initial and final visits (P<0.001). Percentage attainment of A1C=7.0% increased with consecutive visits (37.6%, 43.9% and 48.1% at visits 2, 3 and 4 respectively). A1C=6.0% was realized in 4.9%, 6.8% and 8.2% of the group at visits 2, 3 and 4 respectively. Comparisons between baseline A1C and those measured at the last visit (last observation carried forward) indicated 25.9% and 2.2% respectively exhibited worse and pharmacological-resistant A1C. Fasting plasma glucose (FPG) improved concomitantly (medians (25^{th}, 75^{th} quartiles) of 8.6 mmol/L (7.4, 10.3 mmol/L), 7.8 mmol/L (6.6, 9.3 mmol/L), 7.5 mmol/L (6.4, 9.1 mmol/L) and 7.4 mmol/L (6.2, 8.9 mmol/L) at visits 1, 2, 3 and 4 respectively) but only 42.4% reached the target FPG=7 mmol/L at the final visit. Antiglycemic monotherapy decreased with consecutive visits (34%, 29%, 25% and 25% of the subjects at visits 1, 2, 3 and 4 respectively). This paralleled increases in therapy consisting at least three antihyperglycemic agents (23%, 29%, 30% and 29% of the subjects at visits 1, 2, 3 and 4 respectively).
Conclusions: In this prospective epidemiologic cohort of T2DM patients with baseline A1C>7.0%, 48.1% achieved A1C=7.0% and 42.4% FPG=7.0 mmol/L at the final visit following a 12-month aggressive pharmacological treatment program based on current national guidelines. This improvement likely resulted from enhanced clinical awareness and regular feedback coupled with increased application of combination therapy. While these results suggest that an algorithm based on optimized oral hypoglycemic agent regimes is a useful therapeutic option for management of T2DM, T2DM remains difficult to manage and the disparity that persists between clinical outcomes and current Canadian treatment goals remains significant and unsatisfactory. Further measures to bridge this care gap are clearly warranted.

Conflict of interest:
Paid lecturing: Altana (Drouin), Astra-Zeneca (Drouin, Leiter), Biovail (Drouin), Bristol Myers Squibb (Drouin, Goodman, Woo, Leiter), Boehringer-Ingelheim (Drouin), Eli Lilly (Goodman, Woo, Leiter), Glaxo Smith Kline (Drouin, Goodman, Ur, Woo, Leiter), Hoffman La Roche (Leiter), Merck Frosst (Drouin, Ur, Woo, Leiter), Novartis (Drouin, Ur, Woo, Leiter), Novo Nordisk (Ur, Woo, Leiter), Pfizer (Drouin, Ur), Sanofi-Aventis (Drouin, Goodman, Harris, Ur, Leiter), Servier (Drouin, Leiter), Solvay Pharmaceuticals (Drouin) and Unilever (Drouin)
Advisory board: Altana (Drouin), Astra-Zeneca (Drouin, Goodman, Langer, Woo, Leiter), Biovail (Drouin), Bristol Myers Squibb (Drouin, Goodman, Woo, Leiter), Boehringer-Ingelheim (Drouin), Eli Lilly (Woo, Leiter), Glaxo Smith Kline (Drouin, Goodman, Langer, Woo, Leiter), Hoffman La Roche (Leiter), Merck Frosst (Drouin, Goodman, Langer, Woo, Leiter), Novartis (Drouin, Leiter), Novo Nordisk (Woo, Leiter), Pfizer (Drouin, Langer), Sanofi-Aventis (Drouin, Goodman, Harris, Langer, Leiter), Schering (Goodman), Servier (Drouin, Leiter), Solvay Pharmaceuticals (Drouin) and Unilever (Drouin)
Commercially-sponsored research: Astra-Zeneca (Goodman, Langer, Leiter), Bayer (Goodman), Bristol Myers Squibb (Goodman, Leiter), Eli Lilly (Leiter), Glaxo Smith Kline (Goodman, Langer, Ur, Leiter), Hoffman La Roche (Goodman, Leiter), Johnson & Johnson (Goodman), Eli Lilly (Goodman), Merck Frosst (Goodman, Langer, Leiter), Norvartis (Leiter), Novo Nordisk (Ur, Leiter), Pfizer (Goodman, Langer), Sanofi-Aventis (Goodman, Langer, Ur, Leiter), Schering (Goodman) and Servier (Leiter)

O-0248

Optimal type 2 diabetes management including benchmarking and standard treatment: the Belgian "OPTIMISE" trial

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Background: Diabetes and micro- and macrovascular complications have an important impact on survival, quality of life and health care costs. Effective treatments and interventions reduce this burden and improve the quality of patient care. However, due to a marked variability in preventive and therapeutic approaches, diabetes care as currently provided may not deliver the optimal expected, health-related gains. Benchmarking, an emerging method, incorporates two-sided feedback of physician's individual performance graded alongside the current mean achievement of a peer group as well as patient's target attainment.
Methods: Belgium conducted the pilot trial for the larger non-interventional OPTIMISE study in which 6 European countries are participating. The aim was to study the effect of benchmarking on quality of care in type 2 diabetes patients throughout a 12-month period. The parameters of interest were percentage of patients achieving pre-set targets according to European guidelines (2007) for HbA1c (<7%), LDL-cholesterol (LDL-C <80mg/dl) and Systolic Blood Pressure (SBP) (< 130 mmHg). Results presented hereafter describe the Belgian baseline data and provide an overview of the current level of target attainment prior to benchmarking randomisation.
Results: 94 General Practitioners (GPs) with 1126 patients were randomized to the intervention group receiving feedback for benchmarking and 93 GPs with 1010 patients to the group receiving no feedback. Both groups were highly superposable for baseline demographic, anthropometric and diabetes-related parameters. In the whole cohort, mean age (1 standard deviation) was 66.9 years (10.6) and 54% were male patients. Mean age at diabetes diagnosis was 59.3 years (11.0), with a mean of 7.6 years (6.6) elapsed since diagnosis. Target HbA1c was reached in 59% of patients. Biguanides and sulfonylureas were most frequently used, with a minority of patients (8%) receiving insulin. 27% of patients achieved LDL-C target, lipid-lowering drugs (LLD) were given to 65%, with statins most frequently used: simvastatin (38%), rosuvastatin (28%) and atorvastatin (24%). 80% of patients were hypertensive (77% treated), with 29% at goal for SBP. Only 4 % of patients reached all 3 three preset targets.
Conclusions: Quality of care in type 2 diabetes patients in Belgium at baseline was suboptimal. Interventions to improve levels of care are necessary. The OPTIMISE study will evaluate the effect of benchmarking on quality of care in general practice.

Conflict of interest:
Paid lecturing: Professor Erik Muls (UZ Gasthuisberg), Professor Michel Herman (UCL st Luc).
Advisory board: Professor Erik Muls (UZ Gasthuisberg), Professor Michel Herman (UCL st Luc) and Dr Georges Krzentowski (CHU Charleroi).
Employee: Dr An Matthys.

O-0249

Impact of adding a pharmacist to primary care teams on blood pressure control in people with type 2 diabetes: a randomized controlled trial (ISRCTN97121854)

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Aim: The Vascular Intervention Program (VIP) trial was designed to evaluate the effect of adding a pharmacist to primary care teams on medication management for cardiovascular risk in type 2 diabetes. We hypothesized that addition of a pharmacist would improve blood pressure (BP) control.

Methods: This randomized, controlled trial was set in family physician offices affiliated with a primary care network in Edmonton, Canada. Subjects were eligible to participate if they had type 2 diabetes identified from physician rosters. We excluded subjects who qualified for urgent assessment in a regional diabetes program (A1c >8%; BP >220/120 mmHg; triglycerides >15 mmol/L) or were followed by specialists. The VIP intervention began with a pharmacist conducting a complete medication assessment and limited physical examination. The pharmacist made guideline-based recommendations aimed at optimizing medication management of BP, cholesterol and blood glucose. Follow-up visits were conducted as necessary. Controls received usual care from the primary care team. The primary outcome was proportion of subjects with a ≥10% reduction in systolic BP at 1 year, an endpoint which was considered clinically important a priori. Secondary outcomes included systolic BP change, BP therapy changes, and initiation of ACEI or ARB therapy.

Results: 260 subjects were enrolled and allocated to intervention (n=131) or control (n=129). Overall, mean (SD) age was 59.1 (12.1) years, about half (57%) were women, diabetes duration was 6.5 (7.2) years, BMI was 32.5 (6.5) kg/m^2 and A1c was 7.3 (1.3)%. Mean BP was 129 (15) / 74 (10) mmHg and 151 (58%) had elevated BP defined as ≥130/80 mmHg. There were no statistically significant imbalances at baseline. The primary outcome of a ≥10% reduction in systolic BP at 1 year was achieved by 47 (36%) intervention and 30 (23%) control subjects (OR 1.85; 95% CI 1.07-3.18; p=0.027). Systolic BP decreased significantly in both groups, but fell 3.7 mmHg more with intervention than control (p=0.055 for difference). When the analysis was restricted to subjects with an elevated BP at baseline, 40 (49%) of 81 intervention and 20 (29%) of 70 control subjects achieved the primary outcome (OR 2.44; 95% CI 1.24-4.80; p=0.0099). There was a 6.9 mmHg greater reduction in systolic BP with intervention than control (p=0.004 for difference). Intervention group subjects were more likely to have BP therapy changes (OR 2.26; 95% CI 1.33-3.84) and more likely to initiate ACEI or ARB therapy (OR 8.21; 95% CI 1.84-36.68) compared to controls.

Discussion: Addition of a pharmacist to the primary care team produced a significant reduction in BP and more antihypertensive therapy changes. The magnitude of effect was greatest in those not currently at treatment target. Our results suggest that pharmacists may have a major role in helping to optimize BP control in type 2 diabetes.

No conflict of interest

ORAL PRESENTATION

EDUCATION

From professional and peer education to diabetes self-management

O-0250

Implementation of a structured module for insulin therapy self management education for type 2 diabetes in outpatient hospital settings in France

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Aims: Group empowerment courses are a potential approach to help structuring self-management education for insulin treated type 2 diabetes subjects. As a whole, these actions are yet to be better structured in French outpatient hospital settings.The aim of the present work was to assess the feasibility of such courses in 120 outpatient hospital settings in France and their impact on the structuring of the patient education process.

Methods: The initial education module, including 2 outpatient 90-min long group sessions, focuses on stakes and understanding of diabetes and insulin treatment, practical and technical issues, SMBG and insulin dosage. A 3rd session takes place at 2-3 months in order to help the patient in assessing results, evolution of treatment and dosage, difficulties, contextual issues and setbacks. Educational methods (Learning Nests) are based on adult learning principles, socio-constructivism, social learning and empowerment. Group sessions are precisely conceived with knowledge issues, learning outcome indicators, contextual (individual and social) framing for the patients and actions to be discussed. Operating booklets for patients and manuals for educators make the module reproducible. Twenty outpatient hospital self-management education teams in 6 regional areas of France participate in the experimental implementation. One hundred twenty registered nurses, one from each setting, were trained on a one day basis by a social and educational scientist, in order to set up the module and include 20 Type 2 diabetes patients in each structure (insulin naïve with indication of insulin therapy or previously insulin treated). Socio demographical and clinical data (diabetes duration and treatment, BMI, WC, Glyc Hb at 0 and 3 month) are collected by educational teams. Number of inclusions, programmations, attendance at group sessions, quality of data collection and profiles of recruited patients will be analysed as a whole and among the different centres.

Discussion and conclusion: This study will yield important preliminary data on the potential beneficial contribution of the integration of group empowerment modules in self-management education for insulin requiring type 2 patients in France. Differential implementation and impacts will be analysed from the programmation records and from questionnaires completed by educational teams. These preliminary results will constitute the grounds for future multicenter observational and intervention studies on Type 2 diabetes self-management education in French hospital settings.

No conflict of interest

O-0251

Diabetes peer education and migrant patients: self-help for self-management

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Background/aims: This paper is based on doctoral research that explored Turkish migrants' experience with diabetes in Germany, who are said to be almost twice as likely to suffer from type 2 diabetes as Germans or Turks in Turkey. Health statistics frequently identify minority groups as vulnerable to chronic illness, and qualitative studies explore lay beliefs and conflictual medical encounters. My objective was to examine how the Turkish population in Berlin actively engaged in diabetes care, and investigate which social groups are involved in such local experiences. This paper focuses on the role of peer education in diabetes control among Turkish migrants in Berlin, Germany.

Methods: An ethnographic approach was used, including a 12-month period of participant observation and narrative interviews with members of a Turkish self-help group, their families, and health professionals. Assuming active engagement with illness management, I explored relative access to knowledge and social participation in diabetes peer education.
Results: Interviews with healthcare professionals alluded to a migrant patient group disadvantaged and immobilised by high illiteracy rates, lacking language skills and health knowledge. Ethnographic exploration, however, revealed an active engagement with diabetes despite these challenges. Informal diabetes care is communally negotiated. Local Turkish-origin doctors have initiated a patient-led Turkish-speaking diabetes self-help group and community information events to provide native-language diabetes education. Migrant diabetes patients with access to such support manage their self-care confidently, for example negotiate between clinical German dietary recommendations and their Turkish home cooking. They engage in deliberate practices to improve their diabetes control, rather than representing the common image of the disadvantaged migrant patient.
Discussion: The results of the study imply that, despite low socio-economic status and education level, there is an active interest in acquiring illness management knowledge among members of migrant communities and that subsequent communal responses such as the Turkish self-help group in Berlin are strongly related to confident diabetes control. Further research should investigate informal healthcare practices in various settings. This could greatly inform the design of successful approaches to diabetes education for marginalised communities.

No conflict of interest

O-0252

Patient Expert: A training program for patients to support and coach other patients with diabetes type 2 developed by the French Organization for Diabetes (AFD)

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Aims: To initiate, develop and implement a training program for peer support, in the field of diabetes, at a national level.
Methods: Patient-to-patient support programs are growing in France, as Ministry of Health officially recognized importance of such programs. However, no certified solid and comprehensive training program is available in France for volunteer patients who would like to assist the 3 million people suffering from, or at risk of, diabetes. Based on its 70-year experience of supporting people with diabetes, and its network of 125 local organizations throughout France, French Organization for Diabetes conceived a specific training program: the Patient Expert Program. French Organization for Diabetes strongly promote that patients should be "actors of their own health"; this program first trains patients to be experts of their own disease, then trains them to provide peer support, coaching and guidance to other patients living with diabetes, to run peer support groups, all on a voluntary basis.
Training program content includes both substantial knowledge and technical aspects.
Phase 1 / Trainee strengthen his knowledge on diabetes, environment and treatments, using a specifically designed CD Rom. **Phase 2 /** Learn communication technique to lead peer groups, to conduct one-on-one meetings, to "listen" carefully to other patient's issues, to accompany them throughout their life project and diabetes related issues.
After completion of this training program, the trainee is considered a Patient Expert.
Supervision: A/ A managing committee at French Organization for Diabetes develops and validates training content and procedures, leads program implementation and assessment. B/ A medical committee certifies training content and contributes to program assessment. C/ "Regional Training Referral Volunteers" (2 per region) have been trained. They recruit trainees, guide them throughout the course of studies, foster groups dynamic, organize trainings, and contribute to training content development and evaluation.
Results: An educational CD Rom developed: 1500 copies available.
20 Regional Training Referral Volunteers trained.
150 persons trained to be Patient Experts in Diabetes
600 days of of training organized.
Conclusions: This training program for patients to support and coach other patients with diabetes type 2 is a relevant program in France, and the French Organization for Diabetes has great hope that it will be certified by French public health institutions soon.

No conflict of interest

O-0253

Knowledge, attitudes and practices of diabetic patients in a rural community: Phase I of the community-based diabetes self-management education (DSME) program in San Juan, Batangas, Philippines

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Introduction: Diabetes Self-Management Education (DSME) has been recognized as a fundamental component of diabetes care. The present study comprises Phase I of the proposed 5-year community-based DSME Program in San Juan, Batangas, Philippines. To increase relevance, the data derived from this preliminary study will be incorporated to the educational materials of the program.
Objectives
1. To determine the knowledge, attitudes, and practices of diabetic patients in the rural community of San Juan, Batangas
2. To determine if patient factors such as age, sex, duration of diabetes, type of diabetes, attendance in diabetes classes, level of education, family history of diabetes, and use of insulin affect knowledge, attitudes, and practices regarding diabetes

Study design: Cross-sectional analytic study
Setting: San Juan, Batangas, Philippines
Participants: Known diabetics in the community who either have Type 1 or Type 2 diabetes
Methodology: Participants were selected using stratified cluster sampling. Diabetes knowledge and attitudes were assessed using selected items from the American Association of Clinical Endocrinologist (AACE) Knowledge Test and the Diabetes Attitude Scale (DAS-3), respectively. Both questionnaires were previously locally validated and translated into the Filipino language. FGDs were conducted to ascertain myriad practices of diabetic residents in a rural community.
Results: A total of 156 diabetic residents were included in the study. Mean age of the participants was 56.67 years old, with a female predominance (67.31%). The overall percentage score on knowledge ranges from 12.50% to 83.33%, with a mean of 42.71%. The highest and the lowest mean percentage scores among the knowledge subscales were 61.15% and 23.93% for treatment and self-monitoring, respectively. Majority of the respondents strongly believed in the need for patient autonomy (76.4%). However, less than half believed in the value of tight glucose control (48.2%) and the seriousness of diabetes mellitus (45%). A total of 35 respondents were included in the FGDs (average of 12 per strata). Only 4 out of the 35 diabetic respondents owned a glucose meter while only 16 out of the 35 consult their doctors on a regular basis.
Conclusions: The present study highlights the importance of evaluating knowledge, attitudes and practices as crucial means to understand observed behaviors and to guide behavioral change. By offering culturally-appropriate, cost-effective, and comprehensive diabetes care, the present DSME Program aspires to be a "model of community diabetes care" throughout the country, ultimately attenuating disparities in health outcomes for underserved Filipinos in the rural community.

No conflict of interest

O-0254

Comprehensive care for the prevention and reduction of diabetes: a self-management focused program

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Aim: Diabetes prevention and risk reduction requires comprehensive, long-term care with self-management support. Standardized diabetes clinics may not include interventions in lifestyle management supporting successful behaviour change. We developed and implemented a new program targeting the reduction of metabolic syndrome risk factors for the prevention and reduction of diabetes and prevention of vascular disease. A combination of intensive interactive lifestyle interventions and self-management strategies are integrated into this effective program design.
Method: Participant referral may be from physicians, allied health professionals or self-referral. This multidisciplinary, nurse-managed physician supported program includes a clinical nurse specialist, patient educator, dietitian, exercise specialist, occupational therapist, physicians and psychology

support. Behaviour change strategies target physical activity, nutrition, weight management, psychosocial risk factors, and self-management. This program is 18 months in duration and includes a minimum of 17 visits. Interactive group sessions are enhanced with prescheduled individual follow-up visits with the multidisciplinary team members. A web-based data management system, PROMIS was utilized and modified for scheduling and data usage. Education includes goal setting, motivation, nutrition principles of healthy eating, physical activity and exercise, cholesterol, negative mood, mindfulness and stress management. Self-management tools include trackers for diet, physical activity and mood, pedometers, participant and group contracting and collaborative goal setting.

Results: FBG at baseline 5.9 (5.5, 6.5), N = 228, at 12 months 5.9 (5.4, 6.4) N = 147, p = 0.10. Weight (kg) at baseline 98.0 (84.3,115.9); at 12 months 92.3 (79.5,106.4) N = 144, p=0.002. Waist circumference (cm) at baseline 112 (102,124,), at 12 months 106.0 (96.0,115.0), N = 133, p <0.0001. TC at baseline 5.5 (4.8, 6.3), at 12 months 5.2 (4.3, 5.8), N = 147, p =<0.001. LDL at baseline 3.3 (2.7, 3.9), at 12 months 3.1 (2.3, 3.6) N = 145, p = 0.008. HDL at baseline 1.2 (1.0, 1.4), at 12 months 3.1 (1.2 (1.1, 1.5), N = 147, p = 0.03. TG at baseline 2.0 (1.5, 2.8), at 12 months 1.7 (1.2, 2.5), N = 147 p =<0.0001. SBP at baseline 130 (0.7), at 12 months 121 (1.1), N = 140, p <0.0001 and DBP at baseline 80.5 (0.4), at 12 months 75.9 (0.7), N = 140, p <0.001.

Conclusion: This new innovative model incorporates key self-management strategies for diabetes prevention and management. We conclude that this comprehensive multidisciplinary program, meets the needs of both participants and communities and is a necessary addition to traditional diabetes clinics.

Conflict of interest:
Paid lecturing: S. Chan, A. Ignaszewski, J. Frohlich, G. Bondy - Astra Zeneca

ORAL PRESENTATION

LIVING WITH DIABETES

Psychosocial problems and diabetes

O-0255

Psychological well-being among parents of youth with diabetes in the Diabetes Attitudes, Wishes and Needs Youth Study

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Aims: This study assessed the psychosocial factors associated with psychological well-being among parents of children and adolescents with diabetes.

Methods: Data are from a cross-sectional internet survey of independent national samples of parents of children and adolescents (aged 0-18) with diabetes (N = 4099) from the Diabetes Attitudes, Wishes and Needs (DAWN) Youth Study. Respondents from Brazil, Japan, the US and 5 European countries provided self-report data for all measures. Psychological well-being was assessed by the WHO-5 with scores ranging from a low of 0 to a high of 100. Multiple regression assessed the independent associations of WHO-5 with country, respondent demographic and disease characteristics, and several sets of modifiable risk factors, including aspects of healthcare provision and participation, perceived social support from friends and work, and diabetes-specific burden (financial, work, everyday diabetes management), worry about complications and parent-child conflict over diabetes care.

Results: Level of WHO-5 (mean ~ 55) was modest. All categories of factors made significant ($p < .001$) independent contributions to explaining variance in both outcomes; together these factors accounted for 24% of the variance in WHO-5 and modifiable risk factors accounted for 19%. Controlling for all factors examined, the following significant ($p < .05$, two-tailed) independent associations were observed with modifiable risk factors. WHO-5 was higher among respondents who reported more integrated diabetes care, greater understanding and support from their health care providers, and who participated more in decisions about their child's diabetes care. Respondents reporting higher satisfaction with friend support or work support had higher WHO-5. Respondents reporting more diabetes-specific burden, worry and conflict had lower WHO-5; the association with burden was stronger than any other factor examined.

Discussion/conclusion: This study shows that many parents of children and adolescents with diabetes in all countries have less than optimal psychological well-being, largely due to modifiable risk factors. Strategies for improving psychological well-being include improving health care professionals' provision of understanding, support, and collaborative decision making, enhancing support from friends and work, and reducing worry about diabetes outcomes, parent-child conflict over diabetes management and the financial burden and everyday demands of dealing with diabetes.

Conflict of interest:
Paid lecturing: Mark Peyrot, Novo Nordisk
Advisory board: Mark Peyrot, Novo Nordisk
Employee: Soren Skovlund, Novo Nordisk
Commercially-sponsored research: Mark Peyrot, Novo Nordisk
Other substantive relationships: Mark Peyrot, Novo Nordisk

O-0256

Psychological well-being and quality of life among youth with diabetes in the Diabetes Attitudes, Wishes and Needs Youth Study

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[5] Kinderkrankenhus Auf der Bult, Dept. of General Pediatrics and Endocrinology/Diabetology, Hannover, Germany
[6] Florida State University, Dept of Behavioral and Social Medicine, Tallahassee, USA

Aims: This study assessed the psychosocial factors associated with psychological well-being and quality of life (QOL) among young adults with diabetes.

Methods: Data are from a cross-sectional internet survey of independent national samples of patients with diabetes aged 18-25 (N = 1905) from the Diabetes Attitudes, Wishes and Needs (DAWN) Youth Study. Respondents from Brazil, Japan, the US and 5 European countries provided self-report data for all measures. Psychological well-being was assessed by the WHO-5 (World Health Organization 5) and subjective QOL was assessed by a single-item measure; both measures ranged from a low of 0 to a high of 100. Multiple regression assessed the independent associations of WHO-5 and QOL with country, respondent demographic and disease characteristics, aspects of healthcare provision and participation, perceived social support from family and friends, and diabetes-specific coping.

Results: Levels of QOL (mean ~ 65) and WHO-5 (mean ~ 57) were modest. All categories of factors made significant ($p < .01$) independent contributions to explaining variance in both outcomes; together these factors accounted for 24% of the variance in WHO-5 and 31% of the variance in QOL. Controlling for all factors examined, the following significant ($p < .05$, two-tailed) independent associations were observed. Italian respondents and those living in large cities had higher WHO-5 and QOL. Male respondents had higher WHO-5 and those with type 1 diabetes or using insulin pens had higher QOL. WHO-5 was higher among respondents who reported greater understanding and support from their health care providers, and QOL was higher among those who participated more in decisions about their diabetes care. Respondents reporting higher satisfaction with friend support or family support had higher WHO-5 and QOL. Respondents reporting more successful diabetes-specific coping had higher WHO-5 and QOL; this association was stronger than any other factor examined.

Discussion/conclusion: This study shows that many young adults with diabetes in all countries have less than optimal psychological well-being and quality of life. Most of the identified risk factors for poor well-being and quality of life are modifiable. Strategies for improving psychological well-being include improving health care professionals' provision of understanding, support, and collaborative decision making, enhancing support from parents, and fostering the development of coping skills for dealing with the everyday difficulties of living with diabetes.

Conflict of interest:
Paid lecturing: Mark Peyrot, Novo Nordisk
Advisory board: Mark Peyrot, Novo Nordisk
Commercially-sponsored research: Mark Peyrot, Novo Nordisk

O-0257

Predictors of fear of hypoglycaemia in youth with type 1 diabetes and their parents

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[2] University of Virginia, Department of Pediatrics, Charlottesville, USA

Aims: Fear of hypoglycemia (FOH) can significantly impact quality of life for people living with diabetes, including both patients and their loved ones. The most commonly used measure of FOH is the Hypoglycemia Fear Survey (HFS), composed of two subscales measuring avoidance behaviors (HFS-B) and worries (HFS-W) related to hypoglycemia. However, FOH as measured by the HFS varies greatly across individuals, so it is important to understand factors contributing to level of fear. Research has shown that, in adults with insulin-treated diabetes, FOH is predicted by hypoglycemia history (e.g. frequency of severe episodes) and trait anxiety. Few studies have looked at predictors of FOH in pediatric type 1 diabetes. This study investigated predictors of FOH in a cohort of 305 youth with type 1 diabetes and their parents.
Research methods: This secondary analysis study merged data sets from studies conducted at the University of Virginia from 1998 - 2008. All data sets contained HFS data from youth with type 1 diabetes and their parents, as well as measures of trait anxiety – the State-Trait Anxiety Inventory for Children (STAIC) and the State-Trait Personality Inventory (STPI) for parents. Data sets also included parent report of frequency of severe hypoglycemia (SH) over the past year. Youth in these studies had been diagnosed with diabetes for at least one year (mean/SD duration = 5.24/3.3 yrs), and ranged in age from six to 18 yrs (mean/SD age = 10.59/3.3 yrs). A total of 47.4% of youth were female, 76.9% of parents were mothers, and 92.5% of families were Caucasian.
Results: Linear regressions controlling for age showed that, for youth, both frequency of SH ($p < .01$) and youth trait anxiety ($p < .001$) predicted total HFS scores, and accounted for 21% of the variance in youth scores ($p < .001$). Parent and youth trait anxiety significantly correlated ($r = .36$ ($p < .0001$), but parent anxiety did not predict youth FOH. For parents, linear regressions showed that age accounted for 15% of variance in HFS-B scores ($p < .001$), parent trait anxiety accounted for 8% in HFS-W scores ($p < .001$). Age and parent anxiety predicted HFS total scores, accounting for 9% of variance ($p < .01$).
Conclusions: In youth with type 1 diabetes, as in adults, both SH history and trait anxiety predict FOH. In parents, the child's age predicted behavioral subscale scores, with parents of younger children reporting more behaviors to avoid hypoglycemia. Trait anxiety predicted worry subscale and total HFS in parents, but frequency of SH in the child did not. The final model for parents accounted for only a small amount of variance suggesting that variables not considered in this study are important predictors of FOH for parents of children with type 1 diabetes.

No conflict of interest

O-0258

Innovations in addressing diabetes disparities in homelessness and poverty

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[2] Calgary Drop-In & Rehab Centre, Curriculum Development Research and Best Practices, Calgary, Canada

Homelessness is a growing problem in Canada and worldwide. Despite the significant prevalence of diabetes and other chronic conditions, homeless people frequently encounter many barriers to regular service utilization. The life-long and intense management of diabetes which involves multiple and demanding aspects related to self-monitoring of blood glucose, medical therapy often requiring adjustments, diet, lifestyle modification and continuous education and follow-up, compounds challenges for the homeless population. Effective and appropriate strategies are needed to address complex health needs of this marginalized population.
Project aim: Since 2008, Calgary area, Alberta Health Services, in partnership with the Calgary Drop-In & Rehab Centre has developed an innovative diabetes prevention and management project for people experiencing homelessness and poverty. The specific objectives are: to develop strong partnerships with homeless people and multiple stakeholders; to identify barriers experienced by homeless people and appropriate strategies for delivery of effective diabetes program for homeless population; to increase chances for early detection of diabetes and diabetes prevention and management skills. Further, the project aims to improve the external factors often impacting homeless people's access to effective diabetes care.
Methods: Using the Wagner Chronic Care Model as the guiding principal, the project provides innovative and accessible diabetes screening, prevention and management programs. In order to fully understand the complex needs of the target population, both homeless population and community partners are actively engaged in all stages of the project. All project activities are provided by a multidisciplinary team at the settings where homeless people congregate - Calgary Drop-In & Rehab Centre. The project team is actively involved in improving the availability of diabetes medications and healthy foods to homeless people.
Results: More than 50% of the homeless people are identified at-risk for diabetes, 15-30% has elevated blood glucose and 10% has physician diagnosed diabetes. Access to appropriate primary care, prescription coverage, healthy food and housing are identified as major barriers to effective diabetes care. Innovative diabetes care approaches have resulted in enhanced awareness, access and patient outcomes. Stakeholders have become more responsive to the unique needs of the homeless population.
Conclusions: Active engagement of the homeless people and organizations serving the homeless and dealing with the "whole person" and "their world" are critical in identifying the barriers, needs and best strategies for effective diabetes care. This initiative could serve as a model for delivery of effective diabetes interventions for marginalized populations worldwide.

No conflict of interest

O-0259

Organizing a strategic public health approach to addressing diabetes during disasters

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Aims: The need to treat chronic conditions is especially magnified when there are catastrophic disruptions of the medical infrastructure, when access to medical care and medications is severely compromised or completely cut-off, and when large-scale evacuations of the population occur. Since diabetes has reached epidemic proportions and has so many related co-morbidities, the need to prepare this vulnerable population at times of disasters has increased. Multiple sectors are involved in responding to emergencies so an integrated approach is necessary for developing preparedness plans. Plans need to address pre, during, and post disaster issues.
Methods/results: The U.S. Centers for Disease Control and Prevention (CDC) has organized a work group in the Division of Diabetes Translation (DDT) to facilitate and provide leadership to enhancing a public health response to diabetes during disasters. The areas of focus are: (1) Educating personnel dedicated to emergency preparedness within CDC about diabetes and other chronic diseases; (2) Forming partnerships with and training first responders, shelter personnel, health care providers, and pharmaceutical/device companies to increase capability for emergency response; (3) Providing diabetes-related educational tools and data to prepare for and respond to emergencies.
Discussion/conclusion: The CDC's mission is collaborating to create the expertise, information, and tools that people and communities need to protect their health – through health promotion, prevention of disease, injury and disability, and preparedness for new health threats. As part of fulfilling this mission, DDT is actively working to improve the emergency response for those with diabetes and other chronic conditions during disasters. Prevalence of diabetes at the county level is being introduced to several groups to aid in preparing for emergencies and is being used in preparedness drills at CDC. Training and educational materials for various audiences have been developed by CDC and several partners and are available for use. Efforts are underway to hold a meeting to discuss medication/supply distribution and stockpile issues to be more effectively prepared for disasters. Strategies used, lessons learned, materials developed and future plans will be discussed.

No conflict of interest

O-0260

Screening for depression in type 2 diabetes: should we use the BDI (Beck Depression Inventory), the HADS (Hospital Anxiety and Depression Scale), or a modified measure to correctly identify depression ?

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[2] Université Catholique de Louvain, E.C.S.A., Louvain-la-Neuve, Belgium
[3] University Pierre et Marie Curie-Paris 6, School of Medicine, Paris, France
[4] Assistance Publique-Hôpitaux de Paris (AP-HP), Paris, France
[5] Pitié-Salpêtrière Hospital, Diabetes Department, Paris, France

In order to compare the performance of two screening instruments for clinical depression, we administered the Beck Depression Inventory and the Hospital Anxiety and Depression Scale to 298 patients with type 2 diabetes recruited from an outpatient unit at Pitié-Salpêtrière hospital (Paris, France). Clinical depression was assessed with the depression modules of the MINI structured interview. We conducted factor analysis on self-report depression items to determine core components of depressive symptoms. Criteria for evaluating performance of self-reports were derived from logistic regressions and ROC curve analyses. Results showed that the BDI has better properties to correctly identify depression than the HADS (in its original version). The ability to correctly identify clinical depression is different according to current patients' regimen (oral versus insulin). Results are discussed in light of the recent literature.

Conflict of interest:
Commercially-sponsored research: Serge Sultan, Sanofi-Aventis
Agnès Hartemann, Sanofi-Aventis

O-0261

Living sexuality in the context of Diabetes: body and gender constructions of Cuban and Peruvian people

L. Ledon-Llanes[1], B. Fabre[1], J. Chirinos[2], M. Mendoza[1], A. Agramonte[1], C. Garcia[1], A. Hernandez[3], J. Hernandez[3]
[1] National Institute of Endocrinology, Psychology, Ciudad de La Habana, Cuba
[2] Peruvian University Cayetano Heredia, Public Health and Administration Faculty, Lima, Peru
[3] National Institute of Endocrinology, Diabetes Care Center, Ciudad de La Habana, Cuba

Aims: Gender constructions and meanings related to the own body and health care process are fundamentals in the identity conformation and sexual expression. Considering the limited literature about representations and social meanings that support sexual experiences of people living with Diabetes Mellitus, the study explored meanings of sexual experiences of people living with Diabetes Mellitus from Cuba and Peru.
Methods: There were carried out two segments of the qualitative study: the first one with 10 Peruvians and the second one with 10 Cubans (both groups, women and men). For some people, Diabetes Mellitus was associated to other endocrine diseases (acromegaly, Cushing's syndrome), and all of them were living with body changes as a result of endocrine diseases. There were used an in-depth interview guide and two projective tests. Interviews were recorded and all the information was qualitatively processed, validating it through technical and theoretical triangulation. Ethical aspects were considered.
Results: Sexuality was constructed from a normative sense that demands a strict coherence between biological sex, gender experiences and ways of body representing. Endocrine diseases experienced, body changes resulting and difficulties to accomplish with traditional gender roles, were experienced as a "break" of this "coherence", having a deep impact over their sexualities and identities, especially in men. Even when some differences appeared related to cultural context and particularities of endocrine disease, almost all men referred having changed their life because of their sexual dysfunction and difficulties to sustain their traditional roles as economic providers, while women expressed the deep impact of body changes over their sense of attractiveness and desirability.
Discussion/conclusions: An important dimension of the deep impact that sexuality changes had for these people was related to the sustaining of traditional gender constructions. Cultural context, endocrine illness processes and gender identities defined some particularities in the way they lived their sexualities. It was a general experience living a complex process of "broken identity".

No conflict of interest

O-0262

Medical center for Intendedly Displaced People from Abkhazia

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[1] Ministry of Labor Health and Social Affairs, Abkhazia, Tbilisi, Georgia
[2] Georgian Union of Diabetes and Endocrine Associations, Endocrinology dept., Tbilisi, Georgia

The Medical Center for Intendedly Displaced People (IDPs) from Abkhazia was rehabilitating in the framework of the American-Georgian Military Education Humanitarian Aid Program and under the financial support of the Government of Abkhazia. The Joint Medical Center for IDPs was officially opened in July 2008. The Center will carry out the program for IDPs with diabetes mellitus (DM) "Multifactorial Intervention in patients with DM and Metabolic Syndrome". The Program at its initial stage plans to provide complete laboratory investigations and various counseling for 50 IDPs with the pathologies. In 10 selected participants continuous glucose monitoring will be carried out; 200 participants will undergo diabetes education course; 22 people with diabetes will receive glucose-monitoring means and test strips. The Program will be carried out under the initiative of the Ministry of Labor, Health and Social Defense (MLHSD) of Abkhazia, financial support of the Government of Abkhazia, in close partnership with the Georgian Diabetes Center/Georgian Union of Diabetes and Endocrine Associations (GUDEAS) and participation of the "Caucasus Medical Group". The Program was supported by the IDF-Europe. Official opening of the Center was attended by the Ambassador of the USA in Georgia; Chairman of the Medical Committee of the Georgian Parliament, Minister of Refugees, Minister of LHSD, Chairman of the Government of Abkhazia, members of Abkhazia Government, President of GUDEAS and representatives of local NGOs. IDPs need serious attention and support from the Government and the society in whole. Each program is a step forward aimed at establishing diabetes services for IDPs.

No conflict of interest

OPEN FORUM

TIDES: being prepared for an emergency

0263

TIDES: being prepared for an emergency

D. Jones[1]
[1] King Edward VII Memorial Hospital, BHB Diabetes Centre, Paget, Bermuda

Recent disasters such as Hurricane Katrina and the Tsunami have highlighted the need for relief agencies and diabetes associations to focus on emergency preparedness. Hurricane Katrina was one of the most powerful storms to ever hit the United States. It left in its wake, the loss of medical records and closure of health care facilities which adversely affected the health of many with diabetes.
Many of those in shelters had no medical records and this made it very difficult for the health care providers to replace their medication. Many arrived for help and the only information provided was that they had been on a "blue pill" or "yellow pill".
The purpose of this talk is to identify the many problems patients with diabetes face in the time of a disaster including low literacy rates, generic versus brand names and not understanding the importance of taking their medications.
Education is key. I hope that this talk will not only identify the importance of patient education in respect to medication adherence but will assist in providing some insight into why medication compliance has been poor and how it can be addressed. A summary of a survey on medication compliance in Bermuda will be part of this presentation.

No conflict of interest

OPEN FORUM

Food and diabetes: what's the fuss?

0264

Home cooked vs fast food

A. Gibor[1], S. Rattray[1]
[1] Fresh Ideas, Catering, Plettenberg Bay, South Africa

A brief introduction to Scott and Andy. Who we are, what we do and why we were invited to speak at the seminar, including our experiences with friends, family and guests who also have diabetes.
Outline our topics and define the difference between natural and refined food products as well as slow food compared with fast food. Detailed advantages of home cooked meals and the ease of cooking them.
List the natural ingredients that can be used to assist with diabetes, stressing the point that in no way are any natural remedies a replacement for medicine that has been prescribed by a doctor.
Describe ways to ensure a balanced diet that assists in balancing blood sugar levels, what foods help and what foods hinder. Discuss meal guidelines emphasising that managing your diabetes with food does not mean that you have to lead an un-natural lifestyle. Breakdown the various food groups and suggest alternatives for a balanced diet focusing on the more natural and slow methods of growth and cooking. We will cover aspects such as what happens to various foods during the cooking and storage processes and what the implications to glucose and blood sugar levels there may be. We will also link our session to other sessions in particular food labelling.
A cooking demonstration will be done in conjunction with our talk and will include various cooking suggestions, hints and tips in general and will demonstrate how to cook a delicious meal.

No conflict of interest

0265

Natural vs refined foods

S. Rattray[1], A. Gibor[1]
[1] Fresh Ideas, Catering, Plettenberg Bay, South Africa

A brief introduction to Scott and Andy. Who we are, what we do and why we were invited to speak at the seminar, including our experiences with friends, family and guests who also have diabetes.
Outline our topics and define the difference between natural and refined food products as well as slow food compared with fast food.
List the natural ingredients that can be used to assist with diabetes, stressing the point that in no way are any natural remedies a replacement for medicine that has been prescribed by a doctor.
Describe ways to ensure a balanced diet that assists in balancing blood sugar levels, what foods help and what foods hinder. Discuss meal guidelines emphasising that managing your diabetes with food does not mean that you have to lead an un-natural lifestyle. Breakdown the various food groups and suggest alternatives for a balanced diet focusing on the more natural and slow methods of growth and cooking. We will cover aspects such as what happens to various foods during the cooking and storage processes and what the implications to glucose and blood sugar levels there may be. We will also link our session to other sessions in particular food labelling.
A cooking demonstration will be done in conjunction with our talk and will include various cooking suggestions, hints and tips in general and will demonstrate how to cook a delicious meal.

No conflict of interest

NAMED LECTURE

HEALTHCARE AND EPIDEMIOLOGY

ISPAD Lecture

0266

Children with diabetes: teams, targets, technology and therapeutic education

T. Danne[1]
[1] International Society for Pediatric and Adolescent Diabetes, Kinderkrankenhaus auf der Bult, Hannover, Germany

Half a million children in the world are affected by diabetes with approximately 70,000 new cases every year. Ever-increasing efforts are necessary to accomplish the mission statement of the International Society for Pediatric and Adolescent Diabetes "A better world for children and adolescents with diabetes" under the diverse challenges to pediatric health worldwide. Recent developments indicate that approaches focussed on age-appropriate education of patient, family and other caregivers in intensified insulin treatment are successful in many places. These efforts have been shown to lead to an improved long-term prognosis.
Ideally, the child with diabetes should have access to a specialised multidisciplinary team of diabetes healthcare professionals. The therapeutic goal of a normal somatic and psychosocial development combined with a glycemic target of an HbA1c of below 7.5% for children of all ages has been adopted by many paediatric diabetes centres. On the other hand, recent findings put less emphasis on the long-term risks of severe hypoglycaemia. Thus, there has been a paradigm shift in the treatment of pediatric diabetes. The majority of pediatric diabetologists now believe that the gold standard treatment is intensified insulin therapy. It should mimic the physiological insulin profile as closely as possible thereby allowing the flexibility required with the lifestyle needs of children with diabetes. The choice of rapid-acting, short-acting, intermediate acting, long-acting insulins and insulin analogues as well as devices like insulin pumps and glucose sensors have led to many new pediatric treatment options.
The European SWEET-project (www.sweet-project.eu) is developing a largescale international IT-based benchmarking. This allows to monitor outcome quality as a basis for exchanging best practice models in pediatric diabetology. It is likely that with better understanding of the molecular, medical and psychosocial mechanisms involved, the next advances in the treatment of children of all forms of diabetes are just around the corner.

Conflict of interest:
Paid lecturing: I have received honoraria for speaking engagements, advisory boards, grant support or support for the conduct of studies or scientific meetings from several companies involved in the diabetes field (Abbott, Animas, Sanofi-Aventis, Bayer, DexCom, Diamyd, GSK, Johnson&Johnson, Lifescan, Lilly, Macrogenics, Medtronic, Menarini, Nilimedex, Novoimmune, NovoNordisk, Pharmacia, Roche, Terumo, Unomedical).

MEET-THE-EXPERT

CLINICAL RESEARCH

Physical activity and diabetes: what to prescribe, why and how?

0267

Physical activity and diabetes: what to prescribe, why and how?

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There is increasingly strong evidence for the value of physical activity/exercise in people with diabetes. However, implementation of this evidence is often a challenge. Health care practitioners often have little or no training in exercise prescription, patients may lack motivation to become more active, and there are competing demands on the time of both patients and health care practitioners. In this session we will briefly review current physical activity recommendations and the evidence behind them, but will focus primarily on practical strategies to translate the evidence on physical activity into action.

No conflict of interest

MEET-THE-EXPERT

First line combination therapy for type 2 diabetes

0268

First line combination therapy for type 2 diabetes

B. Zinman[1]
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Type 2 diabetes mellitus (Type 2 DM) is a progressive disease and for most patients, glycemic control will deteriorate over time. Insulin resistance and beta-cell dysfunction are the two most important pathophysiologic mechanisms responsible for the progression from normoglycemia to impaired fasting glucose (IFG), impaired glucose tolerance (IGT) and ultimately to Type 2 DM. In the United Kingdom Prospective Diabetes Study (UKPDS), the early and initial drop in A1c as seen with monotherapy was followed by a progressive deterioration over time whether the patients were treated with insulin, sulfonylureas, or metformin. In another analysis of the UKPDS data, the investigators demonstrated that only a small portion of patients were able to achieve an A1c of less than 7% on monotherapy and that this portion consistently decreased for all therapies over the 3, 6 and 9 year period of follow up.
The current strategy for managing Type 2 DM involves the use of pharmacology that targets pathophysiology. Since most therapeutic agents for the management of Type 2 DM achieve an approximate 1% decrease in A1c, it is not surprising that combination therapy will be required. The need for combination therapy should be recognized early, and in many patients it is entirely appropriate to initiate combination therapy shortly after diagnosis. It is also important to appreciate that Clinical Practice Guidelines are evolving and that currently the Canadian Diabetes Association and the American Diabetes Association Clinical Practice Guidelines recommend an A1c target of less than 7%.
In summary, there is clear consensus that the current management of diabetes is less than optimal and a more targeted approach to glycemic control using multiple agents will be required in order to achieve the desired outcome of reducing complication risk.

Conflict of interest:
Paid lecturing: B Zinman Eli Lilly, Merck, Novo Nordisk
Advisory board: B Zinman Amylin, Eli Lilly, GSK, Merck, Novo Nordisk, Novartis
Commercially-sponsored research: B Zinman GSK, Novo Nordisk, Merck

DEBATE

HEALTHCARE AND EPIDEMIOLOGY

Primary prevention programmes for diabetes: lifestyle vs drugs

0269

Lifestyle

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The worldwide epidemic of type 2 diabetes continues unabated with a projected prevalence of more than 250 million people in the next decade. The risk factors for diabetes that appear to apply to all populations, in the setting of polygenic risk, include sedentary lifestyle, increasing body fat, and ageing. The current inability to modify genetic risk and the lack of enthusiasm to shorten lifespan as means of confronting the diabetes epidemic have translated into efforts to ameliorate those environmental factors that underlie the epidemic. Specifically, lifestyle programs to increase activity levels and reduce body mass have been studied to determine whether and to what extent they can prevent or delay diabetes. Several studies, conducted in far spread parts of the world, have demonstrated a powerful effect of lifestyle interventions to decrease and delay the development of diabetes. The relatively uniform results of lifestyle intervention, decreasing the development of diabetes by ~40-60%, translate into an average four or more year delay of diabetes in many populations. Contrary to expectations, older persons have had a particularly robust benefit with lifestyle programs. Longer-term follow-up results of several of the largest studies have been carried out and demonstrate a durable effect of lifestyle interventions. Relatively few studies have included a medication arm, but the largest of the prevention studies, the Diabetes Prevention Program (DPP) compared metformin and a lifestyle intervention program. The DPP demonstrated in its initial clinical trial period that lifestyle intervention was approximately twice as effective as metformin in preventing the development of diabetes in a high-risk population.
This presentation will review the available clinical trial data that demonstrate the pluripotent effect of lifestyle intervention programs on diabetes prevention as well as their effect on reducing cardiovascular disease risk. These data will be compared and contrasted with the available data with medications.

No conflict of interest

0270

Drugs

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The prevalence of pre-diabetes and type 2 diabetes is growing at an epidemic rate worldwide. We now know that we can prevent or at least delay the progression of pre-diabetes to diabetes. This raises the question, which prevention strategies should be adopted: a pharmacological or a non-pharmacological strategy? I would like to make a case in support of the pharmacological approach.
All the trials that assessed the efficacy of lifestyle modification on the progression of IGT to diabetes are consistent; if sustained, diet and exercise reduce the conversion of IGT to diabetes by 29 to 67%. The problem, however, is that lifestyle modification, particularly weight reduction, is difficult to achieve and even more difficult to maintain on the long term. Fortunately, a number of drugs are now available for the prevention of diabetes.
The Chinese Prevention Trial, the Diabetes Prevention Program and the Indian Diabetes Prevention Program showed that metformin could reduce the risk of diabetes in subjects with IGT by an average of 34%. The Chinese Prevention Trial and the STOP-NIDDM Trial demonstrated in subjects with IGT that acarbose reduces the risk of diabetes by 43%. In the latter study, acarbose treatment was also associated with a 49% risk reduction in cardiovascular events and a 50% reduction in the progression of the IMT of the carotids. The DREAM Study showed in pre-diabetics that rosiglitazone could reduce the risk of diabetes by 60%. And finally, in the ACT-NOW Study, pioglitazone reduced the incidence of diabetes by 82% in IGT subjects.
Diabetes can be prevented. A healthy lifestyle should always be encouraged at all stages of life. Drug should not replace lifestyle modification but should be used judiciously in conjunction to lifestyle modification in a well structured program.

Conflict of interest:
Paid lecturing: Bayer, sanofi-aventis
Advisory board: AstraZeneca, Bayer, Eli Lilly, GSK, Merck Frosst, Novo Nordisk, sanofi-aventis
Commercially-sponsored research: Bayer, Hoffman-La Roche, BellusHealth, Novo Nordisk, Cybiocare

WORKSHOP

Grant-writing for translational research

0271

Grant-writing for translational research

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Translational Research seeks to bridge the gap between scientific research and the community by translating available knowledge so that it is practical and usable to everyday public health and clinical practice. This workshop will address key components of translational research projects and tips for writing translational research grants, with a focus on phase-two translational research, which promotes the adoption of the fruits of promising clinical research by the community-based health care system under uncontrolled and (often) uncontrollable conditions. The workshop will cover the following: (1) necessary project components, including study aims and objectives, background, research plan, and sustainability; (2) tips for grant writing; and (3) avoiding common pitfalls.

No conflict of interest

MEET-THE-EXPERT

FOUNDATION SCIENCE

Genome-wide association scans for obesity and diabetes

0272

Genome-wide association scans for obesity and diabetes

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The field of the genetics of diabetes and obesity has been rapidly advanced by the availability of new technology and by its application in large co-ordinated studies. Previously progress in identifying the genetic basis of type 2 diabetes from either linkage studies or candidate gene association studies had been limited, with only PPARγ and KCNJ11 being proven to be associated with diabetes. The technological advance of genomewide association studies has led, at the time of submission of this abstract, to the identification of 20 genetic loci that are convincingly associated with disease. Analyses in large consortia will identify further loci. The implications of these discoveries for increasing understanding of the aetiology of diabetes will be discussed, as will the role of these loci in disease prediction. Progress in understanding the genetic basis of obesity had been even slower than for type 2 diabetes, but the availability of GWAS has resulted in the discovery of FTO and a series of other loci convincingly associated with obesity. This talk will discuss prospects for uncovering gene-lifestyle interaction of risk of obesity. Although progress following the introduction of GWA studies has been remarkable, most of the genetic variation underlying diabetes and obesity remains to be discovered. A series of alternative explanations beyond common variants may explain this missing heritability.

No conflict of interest

MEET-THE-EXPERT

EDUCATION

Health literacy: what is its implication for education?

0273

Health literacy: what is its implication for education?

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Patients' health literacy level determines their abilities to manage a host of different skills related to diabetes self-care, including: understanding medication regimens, identifying and reaching behavior change goals, communicating effectively with their clinical team, and negotiating the bureaucracy associated with healthcare use. Limitations in health literacy are a potent risk factor for difficulties in self-management and poor outcomes. However unlike other barriers to successful diabetes management for patients around the globe, health literacy deficits can be addressable via a number of approaches to self-care support during and between outpatient encounters. In this session, we will discuss recent research on the epidemiology of health literacy in diabetes, including recent efforts to understand the specific mechanisms linking literacy problems to patient outcomes. We then will review practical methods for identifying patients who have health literacy deficits in real-world clinical environments. Finally, we will discuss ways in which clinicians can improve self-management support for diabetes patients who have health literacy problems by increasing the quality and frequency of interactions. In particular, we will discuss projects in Latin America designed to give clinicians and limited literacy patients the tools they need to be successful.

No conflict of interest

MEET-THE-EXPERT

ASSOCIATION DEVELOPMENT

Traditional medicines in diabetes care

0274

Traditional medicines may be a cost-effective option in treating diabetes

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Is the traditional medicine cost effective in healing diabetes?
Case of Burundi.
In spite of its small area, Burundi has a population of 8 million people whom 90% live in rural area with not enough infrastructure (schools, hospitals, transport, etc.)
Throughout the country, there are both true and false traditional healers who, according to their saying are able to heal any disease. Both say also that they have been inspired by spirits or inherited from their parents.
Some of those healers are organised in associations but each keeps his knowledge as a secret as it is a source of revenue. There is no study done in healing diabetes but those healers keep on saying they are able to heal it. Unfortunately all those who ran to consult them, go back to modern physicians at the end of the day.
The opinions of the administration and of the modern physicians diverge for there is no public presentation of the traditional products. That is why one product can be administered to many patients suffering from different diseases.
Conclusion: People will always run to those traditional healers by belief but whenever they can afford it they go to the public health centers or hospital.
At the beginning, one could say it doesn't cost a lot but at the end you find that you lost the wealth and the health.

No conflict of interest

0275

Traditional medicines must be validated by associations before being accepted as cost-effective diabetes care

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[2] Association Togolaise du Diabete, diabetes center, Lomé, Togo

Aim: This study tries to determine the contribution of diabetes associations for the validation of traditional medicine as cost-effective diabetes care
Method: 469 diabetics, representing 30% of diabetic attendees followed by diabetes educators and physician at the Association Togolaise du Diabete (ATD) centre in Lome, who resort to traditional medicine, have been dispatched into the following 3 groups: the first one (Group1) representing 30% of the total is characterized by the use of usual medicinal plants known for their hypoglycaemic activities, such as Momordica charentia, Cathrantus roseus, used under different forms (decoction, infusion, maceration); the second group (Group2:15%) has used different remedies sold by traditional healers; the last group(Group3:55%) combine medicinal plants with usual antidiabetic drugs The main parameters observed are: Fasting glycaemia, BMI, Blood pressure, type of side effects, monthly costs of treatments. Interviews, contacts with traditional healers, health personals, and researchers of consultation of data records, done.
Results: the average glycaemia was 1, 89+- 1,2g/l for Group1, 2,39+ 0,99g/l for Group2 and 1, 21+ -0,28 g/l for Group3. Some side effects such as nausea, vomiting, itches, diarrhoea and palpitations were observed in less than 5% of cases. 2 cases of death were reported for the group2. The average monthly costs were respectively 1,50 Euros for Group1, 15 Euros for Group2, and 10 Euros for Group3. In these last 6 months, the percentage of traditional medicine users (Group1+Group3) has increased from 30% to 70%, while that of traditional healers remedies (Group3) decreased to less than 5%.
Conclusion: Evidently, this diabetes association knows how to appreciate the cost-effectiveness of traditional medicine, identify and dismiss quacks, easer money and dreams sellers among traditional healers, and so, has the ability to validate successfully traditional medicine before being used as cost effective diabetes care

No conflict of interest

MEET-THE-EXPERT

CLINICAL RESEARCH

Statistical interpretation of clinical trials in diabetes

0276

Statistical interpretation of clinical trials in diabetes

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This presentation begins with a description of the principles of statistical inference that include the concepts of the type I (false positive) and type II (false negative) error probabilities, power and sample size. Factors that affect the type I error probability are described that include various types of biases, as are factors that affect power. These include the influence of multiple tests and missing data. The intention-to-treat principle, both for the design and analysis of trials is described and contrasted with so-called efficacy or per-protocol analyses in which various exclusions are applied. The potential bias introduced by missing data, and its inflation of the type I error probability, is described. The limitations of statistical methods are reviewed and the intention-to-treat design described so as to minimize the potential for bias. The Diabetes Control and Complications Trial as an intent-to-treat trial is contrasted with other trials in which there was substantial missing data. The preservation of power with an intent-to-treat design is also described. Multiple tests of significance, subgroup analyses, and primary plus secondary analyses and their potential weaknesses are described.

Conflict of interest:
Other substantive relationships: John Lachin: Glaxo SmithKline, Novartis, Merck, Takeda, ToleRx, Bayhill Therapeutics

DEBATE

ASSOCIATION DEVELOPMENT

The associations should take the lead in offering diabetes care

0277

Let us not blame only IDF, what are we ourselves doing for diabetes care?

W. Lee[1]
[1] Diabetic Society of Singapore, advisor, Singapore, Singapore

Let us not blame IDF, what are the associations themselves doing for diabetes care? The IDF has been criticised for being irrelevant to and far removed from the needs of member associations. Often this arises from a misunderstanding of the complementary roles and responsibilities of the IDF and its member associations. The IDF leads globally, national associations serve locally.
The IDF is Global flag bearer and advocate, establishes standards and best practices, promotes sharing and exchange of ideas. The IDF is an ideal executive partner for charitable foundations to fund pilot projects for proof of concept and widespread rollout such as the Unite for Diabetes campaign and the the Western Pacific Declaration on Diabetes, and the Task Forces on Insulin, Diabetes Education.
The national diabetes associations should perform the same role within a local context. The national associations will have the local expertise to decide and act on national priorities.
The national association can liaise with IDF and other external bodies such as ISPAD, WHO and aid agencies to identify local needs, serve as points of contact and also to vet and sponsor deserving individuals for exchange programmes. Examples include the Tanzanian Diabetes Association collaboration with the World Diabetes Foundation, Diabetes Australia's role in distributing diabetes supplies, and the Insulin for Life programmes.
Well resourced national associations, like the Finnish Diabetes Association, and the American Diabetes Association, are able to help establish national standards. All national associations should be promoting diabetes awareness and help persuade people to access appropriate care
Local associations also need to make a case for IDF funding and support for their projects. IDF's resources are to be shared with all its members, based on need and the capacity to benefit
National associations must do their part and not just wait for IDF to act.

No conflict of interest

0278

Has IDF forgotten us ?

L. Ipai[1]
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Papua New Guinea (PNG) is part of the Western Pacific Region (WPR). It comprises a large volcanic and 600 smaller scattered islands. Topographically it is among the most rugged in the world. Population is around 6 million. Diabetes first emerged in 1970's as a disease of major Public Health concern in various South Pacific communities, previously regarded as "paradise". Attention was first drawn when a prevalence study in Nauru revealed that about 30% of population had diabetes, an exceptionally high rate second only to Pima Indians. Later studies showed high rates also in some PNG populations, particularly Wanigela and some other coastal tribal groups.
WPR region has 25% of global population and 30% of world's diabetic population. There is great diversity of culture, lifestyle, and affluence. Onset of diabetes is increasingly being diagnosed in younger age groups, e.g. 40-59 years. There is a strong association with obesity brought about by urbanization and Westernization, probably due to deleterious environmental and behavioral changes of acculturation which unmask genetic susceptibility.
There are many challenges facing island nations. Barriers such as great distances, rugged terrains, low literacy levels, low socio-economic status plus poor infrastructure are obstacles to proper management of diabetes. Drugs are expensive and supply inconsistent. Routine tests to monitor diabetes status are often not done due to costs.
In 2000 the Western Pacific Declaration on Diabetes was made by the WHO-WPRO, IDF-WPR and SPC. IDF's contribution to the island nations in the region appears to be not visible. We need IDF's expertise as a partner in achieving common goals. In this age of globalization poor nations seem to be getting poorer, while rich nations get richer, and health is no exception. I believe IDF can do more in technical input, assisting with access to drugs and treatment, strengthening national associations etc.

No conflict of interest

DEBATE

LIVING WITH DIABETES

Healthy lifestyle - diet vs exercise

0279

Exercise

A. Farquhar[1]
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To debate the relative merits of exercise and diet in the context of diabetes is indeed a very weighty matter and perhaps in fact rather artificial since it is well accepted that both diet and physical activity are key components in achieving good diabetes control.
In the management of diabetes lifestyle factors are critical. For most people achieving weight loss can be frustratingly difficult. There is no question that calorie reduction through alteration of diet is the most effective way to lose weight. Unfortunately there are so many different diets, all of which have some expert from somewhere (Oprah to Atkins) propounding their diet's particular benefits. The whole issue of dietary advice can be confusing and challenging for not only the layperson, but also for professionals.
A "diabetic diet" is a term that is still frequently used and in my opinion is not only misleading and useless, but has significant negative connotations.
My presentation will emphasize the multiple benefits of regular exercise that go far beyond easily measured physical/physiological indices. Living well with diabetes is about much more than diet and A1C and Blood pressure and Cholesterol. It's about living a full and active life uncluttered by the myths and misconceptions (often diet based) that still, sadly, shroud diabetes.

No conflict of interest

0280

Diet

D. Cairns[1]
[1] London, United Kingdom

Diet can evoke a range of advice and guidance over what is the optimum eating habits for people with diabetes.
After losing my boyhood dreams to fly jets in the British Royal Air Force in 1989 to diabetes, I quickly realized the importance of diet in helping to control diabetes. However, everybody's experience of diabetes, and diet within one's diabetes management, is different. And guidance can vary around the world.
My own experience has been to adopt a "moderate diet", effectively "lower carbohydrate" which in turn I believe has helped me achieve a normal life and career. In addition it has helped allow me to return to my flying dreams, including two flying projects, www.diabetesworldflight.com and www.diabetesflight48.com.
The first flying project resulted in meeting many communities and people with diabetes while passing through 22 countries, with fascinating insights into diabetes management in different parts of the world. It ranged from Samoa where diet seemed naturally "carbohydrate rich", to meeting Ron Raab in Australia, who was, and still is, a proponent of low carbohydrate diets.
My talk in October will include observations, recommendations and guidance from different parts of the world, and anecdotes of people's experience of "what can work" with respect to diet and diabetes.

No conflict of interest

SYMPOSIUM

CLINICAL RESEARCH

Prediabetes: which organ is the culprit?

0281

Beta cell

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For many years it has been clear that the beta cell is defective in individuals with established type 2 diabetes. This abnormality can be demonstrated following stimulation of insulin release both intravenously and orally. Recognition that insulin sensitivity is an important determinant of the beta-cell's response to stimulation has advanced our understanding of the critical role played by the beta cell in glucose metabolism. Thus, examining insulin responses simultaneously with insulin sensitivity has made it clear that prediabetes is also characterized by beta-cell dysfunction and that diminished insulin release is a characteristic of the pathogenesis of type 2 diabetes around the globe.
Reducing the progression from prediabetes to type 2 diabetes has involved two broad approaches, intensive lifestyle intervention and medications, both of which have been aimed at decreasing insulin resistance and enhancing beta-cell function. These interventions have proven effective and the beneficial changes in glucose tolerance have been shown to occur in part as a result of improvements in beta-cell function. Thus, future endeavors to either prevent or slow the progression from prediabetes to diabetes have to be cognizant of the critical role the beta cell plays in determining abnormalities of glucose tolerance.

No conflict of interest

0282

Muscle

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Despite much work, the cellular mechanisms responsible for insulin resistance in type 2 diabetes and the metabolic syndrome remain unknown. Recent NMR studies have demonstrated increases in intramyocellular lipid content in young lean insulin resistant offspring of parents with type 2 diabetes, suggesting that dysregulation of fatty acid metabolism may be responsible for mediating the insulin resistance in these individuals. In this lecture I will present data that supports a unifying hypothesis for insulin resistance in muscle and liver where imbalances between fatty acid delivery vs. mitochondrial oxidation leads to net accumulation of intracellular diacylglycerol, which in turn activates novel PKCs leading to decreased insulin signaling and insulin action. I will also discuss recent NMR studies demonstrating that insulin resistance in skeletal muscle can promote the development of atherogenic dyslipidemia (increased triglycerides and decreased HDL concentrations) and NAFLD by promoting increased hepatic lipogenesis following carbohydrate consumption.

No conflict of interest

0283

Liver

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The liver is the primary organ to control gluconeogenesis and the temporary storage of glucose as glycogen. Moreover, prediabetic states, e.g. obesity, inherited insulin resistance in relatives of humans with type 2 diabetes (T2D) and women with previous gestational diabetes, are frequently associated with increased content of hepatocellular lipids, also termed steatosis or nonalcoholic fatty liver (NAFL). Steatosis not only correlates with components of the metabolic syndrome and insulin resistance, but also predicts the development of T2D and its cardiovascular complications. Elevated liver fat may be due to partitioning of free fatty acids to the liver (fat overflow) and to imbalanced release of adipocytokines thereby stimulating inflammatory pathways, e.g. protein kinase C, the transcription factor nuclear factor kB, and c-Jun N-terminal kinase 1. This will lead to typical features of the metabolic syndrome: production of triglyceride-enriched lipoproteins with increased circulating triglycerides and decreased HDL-cholesterol, and systemic low grade inflammation giving rise to C-reactive protein. However, the hepatic abnormalities underlying the development of NAFL per se remained unclear. Using magnetic resonance spectroscopy we recently reported that decreased hepatocellular inorganic phosphate and ATP levels could serve as markers of altered mitochondrial function leading to steatosis in human liver. Furthermore, short-term dietary intervention studies provided evidence for rapid regulation of liver fat and insulin sensitivity preceding any changes in muscle fat content. In conclusion, the liver is critical for metabolic fluxes and inflammatory processes which underlie insulin resistance and the metabolic syndrome.

No conflict of interest

0284

Adipocyte

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Adiponectin is a fat-specific hormone which is the most abundantly expressed adipokine in white adipose tissue (WAT). Adiponectin sensitizes the body to insulin and obesity is accompanied by decreased plasma adiponectin levels, which plays a pivotal role in metabolic syndrome and type 2 diabetes - linked to obesity. Adiponectin also directly suppresses atherosclerosis via multiple pathways such as anti-inflammatory action. Adiponectin mediates its biological effects via its plasma membrane receptors, AdipoR1 and AdipoR2. In fact, adiponectin KO mice as well as AdipoR1/AdipoR2 double KO mice show insulin resistance and impaired glucose tolerance. In liver, adiponectin activates AMPK and PPARα via AdipoR1 and AdipoR2,respectively, causing suppression of gluconeogenesis and lipogenesis and stimulation of fatty acid oxidation. In muscle, adiponectin activates AMPK via AdipoR1, causing stimulation of glucose uptake and mitochondrial biogenesis.In endothelial cells, adiponectin protects from increased neointimal formation in response to cuff-injury via AdipoR2. Obesity is also accompanied by decreased expressions of adiponectin receptors in liver, muscle and WAT, which is also causally involved in obesity-linked insulin resistance. Upregulation of plasma adiponectin and adiponectin receptors as well as development of adiponectin receptor agonists may serve as fundamental and versatile therapeutic strategy for obesity-linked morbidities such as metabolic syndrome, type 2 diabetes and atherosclerosis.

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Conflict of interest:
Paid lecturing: Takeda, Novo Nordisk, Sanofi-Aventis, Daiichi Sankyo
Advisory board: Novo Nordisk, Merck, Lilly

0285

Brain

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There is a large body of evidence indicating that the brain plays a crucial role in orchestrating the regulation of peripheral glucose and lipid metabolism. Moreover, evidence shows that abnormalities in CNS circuits contribute to the failure of normal glucoregulatory mechanisms. Neural pathways that regulate energy balance are often overlapping with those that regulate glucose metabolism. Hence, the common link between obesity and type 2 diabetes might involve these common CNS circuits. We will review the current evidence supporting a role for the CNS in the control of glucose homeostasis and in the pathogenesis of type 2 diabetes.

No conflict of interest

0286

Integrated Approach

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Recent advances in genomics, transcriptomics, proteomics and metabonomics technologies offered a great opportunity for more comprehensive understanding of pathophysiology and etiology of complex diseases such as diabetes and obesity. Metabonomics, a novel methodology arising from the post-genomics era, provided an approach which bridges the gap between other "omics" measurements and metabolic end product, since metabolites can be identified and quantified, which reflect the general status of humans more precisely. With its integrated characteristics, this strategy has begun to be employed in pre-clinical and clinical researches, which provide potentially important clues to disease etiology and healthy management. A number of investigations have also been reported to understand the diabetes related metabolic alterations.
We analyzed the serum metabonomic characteristics of Chinese population with normal glucose tolerance (NGT), impaired glucose regulation (IGR) and type 2 diabetes (T2DM) using the metabonomics approach based on the combination of NMR spectroscopy and multivariate data analysis. This study showed a clear metabonomic trajectory from NGT to IGR and further to T2DM, probably indicating the presence of a continuous progressive development axis for the glucose intolerance severity. Furthermore, we found that compared with NGT subjects, the IGR and T2DM participants showed clear serum metabonomic changes highlighted with the dysfunctions of choline metabolism, glucose metabolism, lipid and amino acid metabolisms, and disruptions for lactate and TCA cycle. We can postulate that the abnormal metabolism of nutrient substance by liver, muscle, adipose tissue, and gut microbiota, form a network of inter-regulation in the development of diabetes.

No conflict of interest

SYMPOSIUM

The diabetic foot updated

0287

Community based foot programmes

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Despite the rise of Diabetes and a dramatic poor control (A1C > 7.0% among 75%) there is not a proper policy to prevent complication: a report verified registration exam for eye, foot and microalbuminuria 47%, 58% and 39%, respectively. There are no amputation official data but a few hospital based studies show a prevalence of 45-75%. To circumvent the unawareness among health professionals the Brazilian Save the Diabetic Foot Project started to be implemented in 1992 in Brasilia, where a 77% trend towards major amputation reduction was reached (2000-2004) after the Foot Centre had been set up. Primary care surveys found 7-10% high risk patients (ulcer/amputation) not followed by specialists. Workshops have been delivered for doctors and nurses: over 60 out-patient centres have been implemented. The foot care status has not been followed properly due to a lack of support and ongoing education (firstly addressed by the Project). To urgently reevaluate the Project a Rescue Plan (RP) has focused community care by: 1) diagnosing loss of protective sensation, 2) developing a basic podiatry course, 3) providing education (patients / families), 4) reinforcing the referral-counter referral. The pilot RP shall involve a mobile unit to deliver care in deprived areas comprising 67 health centres (a 559.671 > 40 yr population, 11% DM = 57.163). A 70% screening target by 402 professionals encompasses 40.012 and will be inserted in the Health Secretary institutional framework, supported by the Associação de Diabéticos de Brasília and spread to other Brazilian states in the future.

No conflict of interest

0288

The acute Charcot foot of diabetes

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The acute Charcot foot remains a fascinating enigma. Despite the major morbidity which may result from it, little is known of its causes or its best treatment. Research is made very difficult by the rarity of the condition, and by the absence both of an agreed definition and of reliable diagnostic markers. This means that ever since Charcot's day, understanding has been based largely on uncontrolled observations made on selected series of patients with established disease, and on speculation. Current thought centres on the possibility that the key process in the development of the condition is local inflammation, and that this triggers osteolysis and predisposes to fracture and fracture-dislocation of the bones and joints of susceptible individuals. It has further been suggested that the process may be potentiated by the loss of neuropeptides such as calcitonin-gene related peptide, CGRP, resulting from the underlying neuropathy, and that it may be mediated through the RANKL/OPG signalling pathway. If correct, this hypothesis opens the door to a number of new therapeutic options. The hypothesis has also sparked further work into the processes linking bone breakdown and arterial calcification in diabetes, both of which are linked to neuropathy. This, in turn, has led to increasing awareness of the adverse effect of arterial calcification on left ventricular strain, and the realisation that distal somatic neuropathy, with or without Charcot's disease, is itself an independent risk factor for cardiovascular mortality.

No conflict of interest

0289

Advances in diabetic foot ulcer care

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Persons with Diabetes are prone to develop foot ulcers. Based on VIPS (Adequate vascular supply, infection and critical colonization control, plantar pressure redistribution and sharp surgical debridement), clinicians can determine if ulcers are healable, non-healable or maintenance wounds.
Local Wound Care includes **DIM** before **DIM*E*** (**D**ebridement**, I**nfection **& I**ncreased bacterial burden control along with **M**oisture Balance) before the **E**dge effect representing Advanced Therapies becomes a reasonable option for healable wounds.
There is some evidence that sharp surgical debridement creates an acute wound within a chronic wound and this method of debridement may facilitate healing in healable wounds compared to more conservative measures.
Surface increased bacterial burden as determined by any three signs from the mnemonic NERDS (**N**on-healing, ↑**E**xudate, **R**ed friable granulation tissue, **D**ebris on the surface and **S**mell) is reliable and sensitive for surface bacterial damage responsive to topical antimicrobial dressings. Deep and surrounding skin infection as defined by any three signs of the mnemonic STONEES (↑Size, ↑Temperature Os: probing/ exposed bone, ↑New areas of breakdown, ↑exudate, Erythema or Edema, and Smell) determines the need for a systemic antibiotic. Both clusters of signs are both sensitive and specific.
Moisture balance can be achieved with the correct matching of exudate to moist interactive dressings. If a wound bed is adequately prepared and a wound fails to heal, Advanced therapies including growth factors, skin substitutes and negative pressure wound therapy may have a role to accelerate healing. (Table 1)

Table 1: Advanced Therapies for Diabetic Neurotropic Foot Ulcers

Advanced Therapy	RCT or Meta-analysis	Results
Oasis	Yes	Complete healing equal to PDGF
Growth Factors (PDGF)	Yes	Complete healing
Apligraf	Yes	Complete healing
Dermagraft	Yes	Complete healing
Hyperbaric Oxygen Therapy (HBO)	Yes	Prevention of Amputations
Therapeutic Ultrasound	Yes	Complete healing
Negative Pressure Wound Therapy (NPWT): post surgical complete healing	Yes	Decreased Wound Size

Conflict of interest:
Paid lecturing: Smith & Nephew, 3M, Molnlycke, Colplast, KCI, J&J (Systagenix)
Advisory board: Smith & Nephew (approx 3 years ago), 3M, Molnlycke, Coloplast, KCI, Covidien, J&J (Systagenix), Government of Ontario, Registered Nurses Association of Ontario
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0290

Revascularization approach

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Peripheral Arterial Disease (PAD) represents the most important risk factor for lower extremity amputations (LEA) in diabetic patients, and it affects 49% of diabetic foot (DF) patients. Beside the high risk of LEAs, PAD is associated to a high cardiovascular co-morbidity, such that it is considered as a marker of mortality in these patients.
The possibility of a peripheral revascularization, both endovascular and surgical, particularly in below knee (BK) arteries, changed the prognosis of a large number of patients, in the same way that coronary angioplasty and by-passes changed the prognosis of ischemic heart disease.
Endovascular techniques, have been demonstrated to be at least as safe and effective in the management of PAD as traditional surgical approach, but their repeatability, the lower impact on the general conditions of the patients and the wider indications make them the first-choice strategy for the multi-complicated DF patients.
Unluckily even today, there's some confusion about indications and results evaluation of the endovascular treatment; DF patients have specific clinical aspects which make difficult their classification following the usual criteria.
A multidisciplinary approach in highly specialized centers is the key for achieving a positive and durable clinical success, which should address all the components – local and systemic – that contribute to determine the complexity of these cases.
The management of the local aspects of the DF, as well as the treatment of the systemic pathologies that are most frequently present in these patients have the same importance than the technical success of the revascularization procedures, to heal the patients.
Follow-up and surveillance programs of DF patients submitted to revascularization procedures are mandatory to delay as much as possible recurrences, frequent and severe, worsening an already critical scenario; new promising drugs and technologies, including regenerative medicine options, are now available to cope with this task.

No conflict of interest

0291

Can we treat diabetic neuropathy?

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There is now little doubt that poor blood glucose control is an important risk factor for the development of diabetic peripheral neuropathy (DPN). Furthermore, recent research has shown traditional cardiovascular risk factors for macrovascular disease to be associated with an increased risk of DPN.
There is now strong evidence implicating nerve ischaemia as the cause of DPN. Studies in man and animal models have revealed reduced nerve perfusion and endoneurial hypoxia. These vascular changes strongly correlate with clinical defects and nerve pathology. Clear differences in epineurial blood flow and thalamic magnetic resonance spectroscopy have been demonstrated between subjects with painful and painless neuropathy. Overall, the evidence emphasises the importance of vascular dysfunction, driven by metabolic change, in the aetiology of DPN, and highlights potential therapeutic approaches.
Unfortunately, apart from glycaemic control, there is as yet no treatment that can stop/delay the progression of diabetic neuropathy. However, new compounds have emerged in the symptomatic management of painful and autonomic neuropathies.
Epidemiological data on Diabetic Painful Neuropathic Pain (DPNP) are limited. In one population-based study the prevalence of DPNP, as assessed by structured questionnaire and examination, was estimated at 16%. It was notable that, of these patients, 12.5% had never reported symptoms to their doctor and 39% had never received treatment for their pain. Thus, despite being common, DPNP continues to be underdiagnosed and undertreated. Pharmacological treatment of DPNP includes Tricyclic compounds, SNRIs, SSRIs, anticonvulsants, opiates, membrane stabilisers, the antioxidant alpha lipoic acid, topical capsaicin etc. Over the past 5 years new agents with less side effect profiles have emerged. Management of the patient with DPNP must be tailored to individual requirements and will depend on the presence of other co morbidities.
Finally, there have been recent developments in the treatment of troublesome postural hypotension, and the management of diabetic gasroparesis with pyloric Botulinum toxin injection and gastric pacing.

No conflict of interest

SYMPOSIUM

HEALTHCARE AND EPIDEMIOLOGY

Screening for diabetes: moving to reality?

0292

Rationale for screening

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Type 2 diabetes (T2DM) is frequently asymptomatic, the true onset occurring several years before diagnosis. Around 30-50% of people with T2DM remain undiagnosed, and around 20-30% already have complications at diagnosis. T2DM therefore meets many of the criteria for suitability for screening, however important uncertainties remain.

Justification for screening programmes requires that the overall benefit of testing, resulting mainly from earlier intervention, is greater than any possible harms of testing the population. Whether this criterion is met for T2DM screening remains uncertain. There are no trials and few data on the effects on mortality and morbidity of population-based screening, but modelling studies report reductions in diabetes-related mortality of up to 40%. Studies on the potential harms of screening have mainly focused on those screening positive, showing limited evidence of adverse psychological effects. However, the effect of screening on health behaviours such as physical activity, diet and health service use is uncertain. As the majority of those screened test negative, even a small adverse effect may outweigh a large benefit to the few testing positive.

Intensive treatment of multiple risk factors in patients with established T2DM halves mortality. However, recent trials raise doubts about the effects of intensive treatment of glycaemia in this group, but highlight the benefits of glucose-lowering early in the course of the disease. Earlier onset of intensive glycaemic control may reduce cardiovascular risk. However, there is no trial evidence that detection by screening followed by intensive multi-factorial treatment improves cardiovascular outcomes, or that treatment effective for clinically diagnosed patients produces greater benefit when commenced earlier. This is a critical but unknown parameter in assessing the balance between the costs and benefits of screening.

The arguments for and against screening for T2DM will be reviewed and new data that address many of the outstanding uncertainties will be presented.

Conflict of interest:
Paid lecturing: Eli Lilly, GSK, MSD, Colgate Palmolive and Unilever
Advisory board: GSK
Commercially-sponsored research: Novo Nordisk

0293

Cost-effectiveness of screening

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Screening and early detection is one strategy for minimising the individual and societal impact of type 2 diabetes. While a logical theoretical approach, as yet there are no outcomes studies which demonstrate the effectiveness of this strategy, although the ADDITION study is currently underway.

A number of screening protocols are in use with the most common involving screening for high risk individuals based on clinical information, followed by a laboratory test. In general, the cost of detecting a case of undiagnosed diabetes is low but varies according to the screening protocol. Screening procedures which use routinely available information to identify people at high risk of diabetes or are linked to other screening programs are usually about US$500 for each case detected. Overall these costs are considered reasonable and generally affordable in the context of opportunistic screening programs in countries with well developed health systems.

Since there are no definitive outcome studies on the effectiveness of early intervention in people with screen-detected diabetes, there can be no definitive statement of its cost-effectiveness. However, a number of models have been developed to address this issue. It should be noted that the outcomes of these modelling exercises are dependent on the model structure and assumptions, particularly the estimated clinical benefits of the modelled scenario. Using the US CDC model, the cost per QALY gained by a one time opportunistic population screening of all people over age 25 was estimated at US$57,000.

Screening programs are more likely to be cost-effective if combined with prevention interventions for people found to be at high risk of the future development of diabetes as well as treating people with newly diagnosed diabetes as illustrated in modelling studies from the UK and Australia.

No conflict of interest

0294

Non-invasive: FINDRISC and others

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The risk of type 2 diabetes (T2DM) may be approximated by certain characteristics, so-called risk factors that are associated with the development of the disease. Ideally, risk factors are causal; many of them are relatively easy to determine and some of them may favorably be altered by interventions in order to prevent the progression of hyperglycaemia. Such scores can be used for the identification of undiagnosed T2DM or to predict the future T2DM. Models to develop scores have included various demographic, anthropometric, behavioral and biochemical parameters. The predictors, and in particular their classification varies among different populations and ethnic groups. Only a few T2DM risk scores have been developed to predict the development of the disease. The current ADA website has a simple diabetes risk-prediction test based on non-laboratory data from six questions, relating to height, weight, age, exercise, family history of diabetes and for women, the birth weight of a baby.

There are several other risk scores to detect either undiagnosed diabetes or the future risk of diabetes that have been recently developed in several populations. The FINnish Diabetes RIsk SCore (FINDRISC) was developed as a self-administered questionnaire specifically designed to identify individuals according to their future risk of developing T2DM without the need for laboratory tests. Multivariate analyses and validation were performed using data from the 1987 and 1992 FINRISK studies, respectively. Individuals who completed a questionnaire received a clinical examination including an FPG and an OGTT at the start of the study and the endpoint during follow-up was drug-treated diabetes. The final FINDRISC uses eight questions related to age, BMI, waist circumference, use of antihypertensive agents, history of hyperglycaemia, physical activity, and consumption of fruit, berries and vegetables (www.diabetes.fi). Its sensitivity, specificity and prediction based on AUR-ROC are robust. Individuals with low scores are very unlikely to develop T2DM and can be excluded from further investigation and allow resources to be focussed on those in the higher-risk groups. The FINDRISC is playing a central role in the current Finnish Type 2 Diabetes Prevention Programme. Individuals with higher scores are advised on lifestyle changes within the primary health care and are also given an OGTT to identify undiagnosed T2DM. The FINDRISC was the main tool in pan-European screening and prevention program, the **D**iabetes in **E**urope: **P**revention using **L**ifestyle, Physical **A**ctivity and **N**utrition Intervention (DE-PLAN) project, and it is now widely used in Europid populations.

Several risk scores for the identification of asymptomatic T2DM have been developed in a number of populations. Whether a score was developed for the identification of undiagnosed T2DM or to predict the future T2DM, it seems that most parameters the models have are more or less the same, and also across populations. The differences seem to relate the relative weight of each parameter and cut-points to be used. Diabetes risk scores are useful tools and offer the solution for screening for T2DM and T2DM risk in primary care and by lay people.

No conflict of interest

0295

Invasive: FPG and OGTT

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Diabetes mellitus (DM) is a serious worldwide health problem, associated with significant, preventable complications. Screening has been advocated in order to facilitate early intervention. Whilst the glucose cut off for the disease has been defined based on risk for microvascular complications, glucose as a risk for cardiovascular disease (CVD) has a continuous relationship. Debate has surrounded the concept of pre-diabetes – lower levels of dysglycemia associated with enhanced risk of progression to diabetes and CVD.

The diagnostic gold standard was the OGTT, a test that assessed both fasting glucose and the response to a standardized glycemic challenge. Its practical challenges meant that the fasting plasma glucose (FPG) has been added as an alternative. However, problems with the FPG include logistic difficulties and that 20% of individuals with glucose below 6.9 mmol/l will have DM on an OGTT as they have a deficiency that is only manifest with a glucose challenge. In addition, FPG cannot identify Impaired Glucose Tolerance (IGT).
Alternatives to screening with FPG or OGTT include A1C (glycosylated hemoglobin) testing and risk calculation using questionnaires.
The A1C test is not standardized in many parts of the world and though it provides a simple index of glucose exposure, it is also sensitive to hemoglobinopathies and anemias. The recently proposed addition of A1C to the diagnostic maze would be an unhelpful contribution to the existing confusion.
Questionnaires have been validated in specific ethnicities, but widespread use may be limited in diverse populations.
In conclusion, screening for diabetes should be done by FPG in high risk populations, with a OGTT in individuals with risk factors and elevated (but non-diabetic) FPG. Pre-screening tools (eg A1C, questionnaires) can potentially be used to identify high risk individuals in overall low risk populations; these individuals should then undergo glucose testing (FPG, and OGTT if necessary).

No conflict of interest

SYMPOSIUM

LIVING WITH DIABETES

Stress: the critical factor in type 2 diabetes?

0296

Stress in utero

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Epidemiologic studies suggest that birth phenotypes such as birth weight are associated with subsequent health and disease risk. It is unlikely that this association is causal, because birth weight is, at best, a crude marker of conditions during fetal life that also may directly influence the physiology of the developing individual to produce long-term consequences. We and others have suggested that exposure to prenatal stress may represent one such condition in intrauterine life that has the potential to significantly impact long-term health and disease risk (Wadhwa, 2005). To test this hypothesis, we conducted a study in a sample of healthy young adults with normal birth outcomes born to healthy women with healthy uneventful pregnancies. One half of the study population was born to mothers who had experienced a major stressful life event during the index pregnancy (prenatal stress group; PS), whereas the other half was a sociodemographically-matched population with no history of maternal exposure to prenatal stress (comparison group; CG). Assessments were performed to examine (i) body composition and glucose-insulin metabolism (BMI; basal and post-OGTT levels of glucose, insulin, leptin, adiponectin; fasting lipid profile), (ii) immune function (immune cell trafficking and LPS-stimulated production of pro- and anti-inflammatory and Th1/Th2 cytokines), (iii) endocrine function (basal and post behavioral/pharmacological stress levels of pituitary-adrenal stress hormones, chronobiological regulation of adrenal function, and assessment of HPA-axis feedback sensitivity), and (iv) cognitive function (working memory under basal and hydrocortisone conditions). Our results indicated that the young adults exposed during intrauterine life to maternal psychosocial stress consistently exhibited a significant dysregulation of all these key physiological parameters, thereby placing them at increased risk for developing clinical disorders. Specifically, individuals in the PS group exhibited primary insulin resistance and a lipid profile consistent with the metabolic syndrome (Entringer et al, 2008a), altered immune function with a Th2 shift in the Th1/Th2 balance (consistent with increased risk of asthma and autoimmune disorders; Entringer et al, 2008b), altered endocrine function, with an increased ACTH and reduced cortisol response to stress (consistent with the high-risk endocrine profile exhibited by individuals exposed to early life neglect/abuse; Entringer et al, 2009), and reduced cognitive function (impairments in working memory performance after hydrocortisone administration; Entringer et al, 2009, in press). These findings thereby suggest (a) that ***in utero*** exposure to maternal psychosocial stress may confer negative long-term physiological consequences, and (b) the effects of prenatal stress may directly influence adult health without necessarily being mediated by adverse birth phenotypes such as low birth weight.
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No conflict of interest

0297

Chronic stress, visceral obesity and type 2 diabetes

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Chronic stress represents a prolonged threat to homeostasis that can progressively lead to a deleterious overload and complications caused by both the persistent stressor and the detrimental prolongation of the adaptive response. Stress and emotional status have long been suspected as having major effects on glucose homeostasis. These effects are mediated by glucocorticoids and catecholamines, the principal effectors of the stress response. Epidemiological data provide evidence for a significant positive association between cortisol levels, and hence of the activity of the hypothalamic-pituitary-adrenal (HPA) axis, and the salient features of the metabolic syndrome, particularly visceral obesity and insulin resistance, and the risk for developing type 2 diabetes and atherosclerosis. Moreover, visceral obesity, an unconventional low grade inflammatory state, is characterized by the capacity of adipocytes to express and secrete proinflammatory hormones and cytokines that activate the acute phase reaction and may act as additional chronic stimulus to the activation of the HPA axis. Thus, a vicious cycle may develop, whereby stress-induced chronic mild hypercortisolemia contributes to insulin resistance and adipocyte growth and accumulation, particularly in the visceral depots, and ***vice versa***. Understanding better the underlying mechanisms of these complex interactions will hopefully provide novel insights into the pathophysiology of visceral obesity, type 2 diabetes and their cardiometabolic complications and will help introduce appropriate therapeutic interventions.

No conflict of interest

0298

Inflammatory stress

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Although type 2 diabetes (unlike type 1 diabetes) has not been traditionally regarded as a disease of the immune system, there is increasing evidence that activation of the innate immune system and chronic low grade inflammatory stress play a major role in the pathogenesis of type 2 diabetes and the metabolic syndrome, and associated clinical and biochemical features. The evidence for this includes abnormal blood levels of acute-phase reactants in type 2 diabetes (e.g. triglyceride, C reactive protein [CRP], fibrinogen, sialic acid, low levels of albumin, testosterone, zinc etc). Epidemiological clues that inflammatory stress is related to type 2 diabetes include the graded increase in inflammatory markers with increasing features of the metabolic syndrome and the many studies which show that elevated inflammatory markers and proinflammatory cytokines predict the onset of type 2 diabetes. Indicators of inflammation (e.g. elevated serum sialic acid) are amongst the strongest independent predictors of cardiovascular mortality in type 2 diabetes and it is likely that activated innate immunity is the common antecedent of both type 2 diabetes and atherosclerosis. Anti-inflammatory drugs such as aspirin reduce CRP and triglyceride and at the same time lower glycaemia and insulin resistance. The IL-1 receptor antagonist anakinra has recently been shown to reduce glucose levels and improve insulin secretion.
Stressors that produce inflammation in type 2 diabetes include increasing age, inactivity, obesity, diet, smoking and psychological stress. These are modified by individual susceptibility caused by racial and genetic factors and low birth weight. Adipose tissue is an important inflammatory source in type 2 diabetes, not only because of cytokines produced from adipocytes (e.g. TNFalpha, IL-6, reduced adiponectin etc), but also because of infiltration of fat by proinflammatory macrophages. Macrophage infiltration and inflammation of the islets also seems to be a key part of the pathogenesis of type 2 diabetes.

No conflict of interest

0299

Oxidative stress

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The different forms of diabetes share high level of glucose in the blood and the tendency to develop a series of complications highly costly in terms of longevity and quality of life. Recent findings connect diabetic complications to high glucose generated oxidative stress. High glucose determines superoxide production at mitochondrial electron transport chain level. Superoxide reacts with nitric oxide producing peroxynitrite that determines DNA single strand breaks and PARP activation. GAPH modification operated by PARP enzyme determines the activation of the four major pathways known to be linked to diabetic complications: the augmented flux of polyol pathway, the increased formation of advanced glycated end products, the activation of protein kinase C and the increase of the hexosamine pathway flux. Different ***in vivo*** and ***in vitro*** studies support this unifying theory that is opening new perspectives in the development of strategies to control diabetes complications, but is also casting a different light on the molecules already in use.

No conflict of interest

SYMPOSIUM

FOUNDATION SCIENCE

Type 1 diabetes: from pathogenesis to intervention trials

0300

Monoclonal antibody-based approaches in type 1 diabetes

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Clinical studies have shown that the loss of insulin production in the first years of Type 1 diabetes can be attenuated by treatment with FcR non-binding anti-CD3 monoclonal antibody (mAb). These studies have also shown improvement in insulin requirements. The mechanism of the anti-CD3 mAb in humans is not clear however. MAb treatment causes a transient reduction in the number of circulating CD3+ T cells but the kinetics of the changes in cell counts and the expression of T cell receptor excision circles (TRECs) suggests that the recovering cells are not new thymic emigrants. We had found that clinical responders to anti-CD3 mAb treatment could be identified by an increase in the relative number of circulating CD8+ T cells. When CD8+ T cells are isolated from patients treated with anti-CD3 mAb they show regulatory function ex vivo. In vitro, we have found that CD8+ T cells cultured with FcR non-binding anti-CD3 mAbs acquire regulatory function and inhibit proliferation of CD4+ T cells. The cultured cells express Foxp3, CD25, GITR, and CTLA-4. TNF-α is required for their induction. The effects of TNF-α for induction of the cells involves signaling through the TNFRII that is expressed on the most potent CD8+ Tregs. We conclude that anti-CD3 mAb can induce long term attenuation of progression of Type 1 diabetes. Our studies suggest that anti-CD3 mAbs induce CD8+ Tregs in vivo. The expression of TNFRII identifies the most potent adaptive CD8+ Tregs.

No conflict of interest

0301

Autoreactive CD8+ T cell specificities in human type 1 diabetes

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Type 1 diabetes is a T cell-mediated autoimmune disease with β cells being the target of the autoimmune destruction process. The mechanism of destruction is still unknown, but recent evidence points to CD8 T cell autoreactivity associated with autoimmunity and loss of β cell function in new onset type 1 patients as well as recurrent autoimmune islet destruction in type 1 diabetic islet transplant recipients. Indeed, circulating CTLs can kill β cells via recognition of a glucose-regulated epitope. These results also identify a mechanism of self-antigen presentation that is under pathophysiological regulation and could expose insulin-producing β cells to increasing cytotoxicity at the later stages of the development of clinical diabetes.
To allow fast detection of low frequency circulating islet autoreactive CD8 T cells, we developed a fast and high-throughput assay determining T cell responses in stored blood of T1D patients using quantum dots (Qdots) as fluorochromes to generate peptide-HLA multimers instead of conventional tetramers. This allowed the simultaneous screening of eight different epitopes derived from Insulin, Pre-pro-insulin, IA2, GAD65, IGRP and pplAPP, with high specificity and sensitivity. Increased frequencies of circulating islet autoreactive T-cells were detected in T1D patients at disease onset compared to non-diabetic controls. Changes in their absolute numbers were detected after clinical islet transplantation and during clinical immunotherapy.
Our studies imply that CD8+ autoreactive T cells are involved in the final pathway of β cell destruction leading to insulin deficiency, hyperglycemia, and clinical type 1 diabetes. Our findings further suggest that autoreactive CTLs are important targets for immune-based interventions in type 1 diabetes and argue for early, aggressive insulin therapy to preserve remaining β cells.

No conflict of interest

0302

Antigen-driven pancreas-specific immunosuppression by autoreactive CD8+ T cells

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Blunting autoreactivity without compromising systemic immunity remains an elusive goal in the treatment of autoimmunity, including type 1 diabetes (T1D). Traditionally, vaccines have been used to expand T- or B-lymphocytes capable of affording protection against pathogens or cancer, or to delete T- or B-lymphocytes capable of causing autoimmunity. Here, we propose to cure T1D by using a 'vaccine' that induces the expansion (rather than the deletion) of autoreactive CD8+ cells. This new type of 'vaccine' consists of nanoparticles that are coated with autoantigenic peptide/MHC class I complexes. Such particles selectively induce the expansion, in an antigen-specific manner, of small pre-existing pools (generated spontaneously during disease) of memory low avidity autoreactive CD8+ T-cells having exquisite, non-antigen-specific, anti-diabetogenic properties. High-avidity (pathogenic) autoreactive CD8+ clonotypes are not expanded by this treatment because, unlike their low avidity counterparts, they do not spontaneously differentiate into memory cells during diabetogenesis, presumably because they die in response to chronic stimulation with self-antigen. Most importantly, these peptide/MHC-coated nanoparticles can not only blunt the progression of insulitis to overt diabetes in pre-diabetic animals, but also restore normoglycemia in acutely diabetic NOD mice. Therapy was inconsequential in 'autoantigen-inexperienced' mice; and diabetic mice engineered to bear an immune system blind to a therapeutic epitope, hence lacking epitope-experienced T-cells, were specifically refractory to the cognate pMHC-nanovaccine. The observation that pMHC-nanovaccines blunt autoimmunity by boosting autoregulatory T-cell memory exposes a novel paradigm in the pathogenesis and treatment of autoimmunity.

No conflict of interest

0303

Antigen-specific versus non-antigen specific antidiabetogenic strategies

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The pathogenesis of type 1 diabetes (T1D) is proposed to progress over several stages. Subjects are born with genetic susceptibility largely conferred by HLA. Islet autoimmunity is triggered in these genetically predisposed individuals and ß-cell killing by cellular immunity is activated leading to insulin deficiency. The autoimmune insult of progressive and selective killing of β cells, may take months to years. Throughout this autoimmune prodrome several genetic, autoimmune and biochemical markers may predict the disease prior to clinical

onset. Once the clinical disease is established, the patient will be dependent on exogenous insulin and will require strict control to sustain euglycemia and minimize complications. Primary prevention trials, for example using nasal insulin in Pre-POINT are considered. Gluten-free diet was given to islet autoantibody-positive children in the PREVFIN trial without any significant preventive effect. The TRIGR trial is an international effort to test if hydrolyzed casein milk formula can reduce T1D risk among high-risk infants. Vitamin D (cholecalciferol) is tested in an ongoing randomized, feasibility pilot study in Manitoba, Canada. The Nutritional Intervention to Prevent Diabetes (NIP-Diabetes) is testing a proposed preventive effect of oral docosahexanoic acid (DHA) against islet autoimmunity. Secondary prevention trials with parenteral insulin in islet autoantibody positive first-degree relatives did not prevent T1D. Non-antigen-specific agents without effects were cyclosporine, BCG vaccine, ketotifen, and nicotinamide, as in ENDIT and DENIS. Tertiary prevention trials have been antigen-specific or non-antigen specific. Immune modulation with alum-formulated GAD65 shows promise to reduce the loss of ß cells. Numerous intervention trials with immune suppression have at best had transient effects in preserving residual β-cell function. CD3 monoclonal antibodies had some effects in postponing autoimmune ß-cell destruction with preservation of endogenous insulin production. Novel prevention and intervention trials are needed to prevent the triggering of autoimmune insult and to halt the autoimmune ß-cell killing.

Conflict of interest:
Advisory board: Diamyd Medical AB, Stockholm,Sweden

SYMPOSIUM

EDUCATION

Establishing diabetes education in emerging countries

0304

Diabetes education development in China: a two decade story

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Aims: To give an overall view of diabetes education in China, and assess and summarize evidence and gaps in the literature regarding diabetes education in China.
Methods: History review of diabetes education in China and systematic literature review.
Results and discussion: Diabetes education had a great impact on glycemic control in China, but China has a long way to go to improve the way they deliver diabetes education, for diabetes education in China is rather didactic, lack of structure or standards, behavior change is not emphasized, and most importantly, China does not have enough qualified diabetes educators. The literature review supports the conclusion that diabetes education can improve glycemic control in short duration and it also has some positive effect on lifestyle behavior. However, several limitations were noted in the literature reviewed. First, the design was not very reasonable. Frequently selected convenience samples and assigned to different groups according to patients' willingness could create bias. The second concern pertained to study methods. Many studies failed to report demographic information about sample groups; for example, source, education level, income, occupation, type and duration and complications of diabetes were not always adequately described. The third consideration was the variety of different outcomes measurements. Not a study mentioned blinding assessors. The reliability and validity of the instruments used to measure knowledge and behavior change were deficient. Last but not least, the duration of observation was rather short. The durations of most studies were 3-6 months, thus, the impact of diabetes education on chronic complications and medical cost could not be evaluated.
Conclusion: China should reform the way they deliver diabetes education, for example, set up standards for diabetes education, evolve diabetes education from didactic teaching to more theoretically based empowerment models, and long-term impact of diabetes education should be evaluated.

No conflict of interest

0305

Diabetes education in Georgia

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Education of people with diabetes has become an integral part of diabetes care worldwide. Effect of education on treatment outcomes first was demonstrated in 1972. Unfortunately in 1970s we lived in society, where many ideas, common for international diabetes/scientific society were unacceptable. Though progress was "penetrating our everyday life". In the second half of 1980s leading centers started to implement patient education. In Georgia first "5-day in-patient education course" was initiated at the end of 1980s. It was carried out at the Dept. of Metabolic Disorders (now Georgian Diabetes Center/GUDEAS). The Course was based on M. Berger/V. Jorgens first books were translated into Georgian. Past 20-yrs were the hard period for our country – economic, energy, political crises, healthcare system (HCS) reorganization/lack of insurance system international processes. Still patient education was implemented at the Diabetes Center, Pediatric Hospital where most new cases of type 1 diabetes (T1DM) are supervised; later education was initiated in other places. Due to objective reasons, regular, obligatory group education courses for T2DM, could not be carried out though individual training was performed. Since 2000 we realized that only TPE could not improve the treatment outcomes, diabetes health professional education (DHPE) needs attention. Today education carried out by the GUDEAS includes: TPE, DHPE, Medical students, Society. Lately various institutions show interest in TPE; pharmcompanies start its sponsorship. Diabetes education is a complex system, where all elements are equally important. If only TPE is addressed – we will face reality where "Educated patient is too expensive". Thus, main goal is – change mentality of the whole society. This needs time and effort.

No conflict of interest

0306

Diabetes education in Brazil: the successful experiences of FENAD, ANAD and ANBED

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FENAD, **"National Federation of Diabetes Associations and Entities"**, joint of Brazilian Diabetes associations, acting in the advocacy of the people with diabetes offering guidance in the creation of new associations. It organizes an annual campaign involving more than 1000 Brazilian cities, disseminating information, guiding, and educating people on diabetes and its complications, preventions (~1 million glycemia tests). This action involves the Municipal Health Secretaries with their diabetes' professional team. The media also plays an important role disseminating education and awareness to every population levels.
ANBED, **"National Brazilian Association of Educators in Diabetes"** was conceived within the format of the American Association of Diabetes Educators, and IDF's guidelines. It created the first Post Graduate Course for the Formation of Diabetes Educators. The first presencial course started February 2008 and finished December 2009 with 360 hours, graduating 20 educators in diabetes. In 2009 it starts with Distance Learning Courses available to all States of Brazil.
ANAD, "National Association of Assistance to the Diabetes" with the mission of improving the lives of the people with diabetes has two lines of action: with the patients and with professionals through a continuous education in Diabetes.
Patients have an educational program with great success in captation, permanence and results, through educational techniques applied in interventions to specific groups.
The mass media education is done through periodicals, magazines, TV and radio programs with web site available, and printed educational material such as comics, cartoons, folders and books as well as glycemia tests campaign and diabetes complications prevention. An Annual Multidisciplinary Multiprofessional Congress is organized with courses in different areas: medical specialties, nutrition, nursing, psychology, physical activities, odontology, podology, an opportunity to recycle and update knowledge.

No conflict of interest

0307

Distance education for educators in India

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Background: In India's urban areas, approximately 12 percent of adults live with diabetes, compared to only seven percent in the United States (CDC data, 2005) and the United Kingdom. With 40.9 million diabetics, India has the highest incidence of diabetes in the world. Additionally, research has identified a genetic factor that predisposes Indians to the development of diabetes.
There is a great need for trained health care professionals in India, including nurses, dieticians and nutritionists, to educate patients about proper diabetes care. Besides teaching basic aspects certain skills need to be imparted so as to make patients self-reliant in daily chores.
In India, specialized training for nurses is available for intensive care, coronary care, maternal and child health, dialysis and neurosciences. In a few isolated cases, nurses working in close liaison with specialists have been motivated to learn "care skills" and teach them to patients with diabetes. A couple of pharmaceutical firms have trained on short term basis, a few nurses in this field who are assisting physicians in few clinics in metropolitan cities.
There is no formally recognized diabetes management curriculum for allied health professionals in India. In 2007, Project HOPE launched the "India Diabetes Educator Project." A six-month distance learning program at training centers with onsite workshops will empower the allied health cadre of professionals. The curriculum includes patient empowerment to deal with daily self-care and prevention and management of complications. Forty Master Trainers (MTs) will be trained from 10 Diabetes Centers to ensure sustainability.
Methodology: International experts conducted screening of various medical centres throughout India and realized a strong need of imparting the knowledge and skills to effectively manage diabetes and empower patients living with diabetes. Further step was taken towards training professionals with some standardized skill based information regarding diabetes. Indian experts were roped in to ensure cultural adaptation and regional specific practices. Forty MTs will train 3000 allied health professions.
Outcomes: Training Centers were identified based on interest in strengthening diabetes management, good turnover of patients with diabetes, and adequate training infrastructure. Twenty-two MTs have been trained up till now. Distance learning mode was identified as the most cost effective to impart quality diabetes management. Onsite workshops were identified as contact points and standardization of training materials was done in order to attain uniformity. Workshop details, student assignments and other supplementary materials are provided in trainer manual. Training content, PPTs and methods for implementing interactive sessions are included on a CD - ROM.
Conclusion: By using distance learning technology reaching the maximum number of health professionals and imparting diabetes education will be rapid and effective.

No conflict of interest

SYMPOSIUM

ASSOCIATION DEVELOPMENT

Association and governments: interaction and co-operation

0308

Government-association interactions: how to go about this in the right manner

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The State has a governing responsibility to ensure that there is the required delivery of services within legislative and policy frameworks. The Government therefore accepts primary responsibility for the development of policies and legislation to facilitate and direct the design and implementation of service programmes in a given field.
It is the role of associations to deliver services efficiently and effectively within the framework of Government policies and strategies consulted and negotiated between associations and Government.
Associations must work in partnership with Government to achieve common aims and objectives. Associations are accountable to Government for their policies and service programmes. They must also be open, transparent and accountable to the public.
The right way for an association to interact and to go about conceptualising the partnership with Government is firstly to accept that both parties have a shared vision and responsibility for the delivery of appropriate services within set frameworks according to the needs and problems. Diabetes being an upsurging problem it is the shared vision of both to overpower this silent epidemic. As associations reflect the diversity of society, **firstly** they must promote local initiatives and problem solving. Through their work in a broad array of fields including the health sector, they must create **awareness** of the problem at the "grass root" level using the numerous volunteers associated with them. By empowering citizens to promote change in the community, they become the tool for change and Government recognises them as an advocacy group.
Secondly: private enterprises become aware of the local problem and tend to financially help the associations to carry out the set activities. Associations hence become a space between the profit making sector and the Government. Enterprises can negotiate with Government for other interests as they are also contributing in the shared vision of Government, creating a partnership across and among the 3 sectors.
Thirdly: associations take up challenges and enable social change, that the public and private sector simply cannot do. Government is then drawn to the associations to take risks that are economically unacceptable to business and politically unacceptable to Government.
In addition, non-governmental association advocacy campaigns induce a reluctant Government to adopt policy reforms and force improvements in business practices. Governments can force businesses to allocate a certain % of their profit annual for corporate social responsibility.

No conflict of interest

0309

Harmonising interactions between governments and associations

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Harmonizing means: to bring or come into agreement. Both Government and Association bodies have programs to follow. When one looks closely, the program may not complement each other, but rather compete in a contrary manner, or compete without resolve.
Both bodies should realize their limitations.
Each country has placed by-laws under which Associations are governed, so much so as to avoid misuse of funds and influence. Despite the by-laws, the manner, which the Government and Association address issues are contrary to the spirit of harmony.
Associations have to define their status on annual basis; "who are we",the organization, the programs in place, identify the partners and supporting roles. On the other hand – the Government bodies should do likewise and know "who are they".
One of the best examples on the issue of harmonizing between two or more bodies is the document, "International Harmonization of the Regulations on New Pharmaceutical Drugs". This has created precedence into safety of new drugs and other related issues.
Therefore, it would be valid for the International Diabetes Federation to lay ground rules to achieve harmonization and effectively gain the confidence from the various Governmental bodies, eg Department of Non-Communicable Diseases-hence oversee very important issues like availability of insulin, foot care programs etc.

No conflict of interest

0310

Co-operation between associations, governments and international organizations

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Diabetes is a global problem having devastating human, social and economic impact. Today over 250 million people live with diabetes in the world. It is also estimated that 50% of people living with diabetes are unaware of their condition associated with diabetes. The low level of awareness is often due to inadequate national healthcare policies.
Social and economic costs of diabetes rise with the increasing prevalence of disease and its complications, which often lead to the premature disability and

death. Diabetes is the third cause of death from diseases following cardio-vascular disease and cancer.
Considering the number of people with diabetes (one in every five people in the world) all states suffer huge economic costs mainly due to social welfare benefits. On the other hand saving on diabetes and ignoring the disease leads to irrecoverable losses.
Governments are committed to the implementation of international instruments. The St. Vincent Declaration calls national governments for prompt and effective actions to improve life and health of people with diabetes. The UN Resolution on diabetes encourages governments to work out national policies for prevention, care and treatment of diabetes in line with the sustainable development of their health care systems taking into account the internationally agreed development goals. The pandemic of diabetes in the whole world requires urgent actions but governments and healthcare providers cannot bear the whole burden of diabetes. It is of crucial importance "to unite for diabetes" involving all stakeholders and combine their efforts. In this regard the triangle comprised of governmental institutions, associations and international organizations constitutes the core of the bridging gaps between normative acts and the reality. The participatory relations on both the vertical and the horizontal levels is the pre-requisite of making change.
In the presentation the roles and functions of these partners and the successful model of cooperation will be defined.

No conflict of interest

0311

Interacting with the government to get the most for the cause of diabetes care

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The epidemic of diabetes continues to threaten the economic and social development and the lives and health of millions of people. By the year 2025 it is estimated that there would be three hundred million (300) persons living with diabetes.
In the region of the Caribbean thirty five million (35) are currently affected and the World Heath Organization (WHO) forecasts an increase to sixty four million by 2025. In 2003 it was estimated that diabetes was related to some three hundred thousand (300,000) deaths in Latin America and the Caribbean, although official statistics link only seventy thousand (70,000) deaths to disease annually. Additionally the societal costs of diabetes were estimated at sixty five billion dollars in 2002.
Countries are now at a critical juncture and the time has now come for governments to implement comprehensive and integrated policies and programme and actions to reverse this deadly epidemic.
The Diabetes Association of Trinidad and Tobago's objective is to continue to partner with the government in promoting the health of persons with diabetes and to prevent or delay the onset of diabetes through Education, Advocacy and Research. The association has come a long way since 1988 Incorporated by an Act of Parliament of the T&T Government, Act No. 15 of 1988-89 as a charitable voluntary community service organization for diabetes.

No conflict of interest

OPEN FORUM

LIVING WITH DIABETES

Transitional care - adolescence to adulthood

0312

Transitional care - adolescence to adulthood

D. Hawkes[1]
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Adolescents are now widely recognized as a distinct group of individuals with specific health needs. Transferring patients has been around as long as paediatricians. Simple transfer has been challenged in the last decade by 'transition', emphasizing the need for the change to adult care to be a guided educational and therapeutic process rather than an administrative event. The American Society for Adolescent Medicine define good transition as 'the purposeful, planned movement of adolescents and young adults with chronic physical and medical conditions from child-centred to adult-oriented health care systems'
Transition from paediatric to adult care is a major milestone and commonly poorly done. It coincides with other transitions occurring at this time of life:
From parental supervision to independence, from school to post school options. Anecdotal evidence suggests this is the period when young people with diabetes 'drop out' of the system, often having no specialist follow-up only picking up insulin prescriptions.
Evidence from our service suggests that failure to attend transition results in poor engagement with the adult clinic and a poor uptake of annual review appointments, thus increasing the likelihood of developing microvascular complications and increased mortality. Well planned transition programmes however, have measurable benefits for young people and their parents including improvements in clinical, educational and social outcomes. For these reasons transitional care should be a multidimensional, multidisciplinary process which addresses the medical, psychosocial and educational needs of the young person.
In this open forum I aim to discuss the specific needs of the adolescent, explore models of care and obstacles to good transition, review the literature, and share the views of young people and their families from a local clinic.

No conflict of interest

SPEAKERS' CORNER

Celebrating diabetes

0313

Celebrating diabetes

S. Sasseville[1]
[1] *Montreal, Canada*

An inspirational speech about a thrilling journey to the summit of Mt Everest. Sébastien Sasseville was the first Canadian living with type one diabetes to reach the highest point on earth, the third in history. In this session, Sébastien will be sharing precious lessons learned not only during the climb, but over the years spent preparing for Mt Everest. Diagnosed in 2002, he quickly decided to make diabetes the best thing that had ever happened to him. Sébastien will be talking about the process that leads to the acceptance of the disease, how to be empowered by obstacles and how diabetes can be gift. From base camp to summit via the Khumbu ice fall and the death zone, the audience will be taken on this iconic ascent through breathtaking pictures and the exciting stories. Climbing Everest is no small task, climbing it with diabetes is even riskier. This speech will address the different strategies and innovative solutions that were used on Sasseville's 2008 expedition. Most importantly, he will reinforce and share his vision that diabetes should not be a limitation and that people with diabetes can do anything they want.

Conflict of interest:
Employee: Animas Canada

OPEN FORUM

Kathmandu Declaration: UNR implemention of prevention strategies

0314

Primary prevention

M. Wijesuriya[1], *R. Williams*[2], *C. Yajnik*[3]
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[3] *King Edward Memorial Hospital, Diabetes Unit, Pune, India*

Kathmandu Declaration: UNR implementation
The Kathmandu Declaration was developed as an action plan of the IDF UNR on Diabetes 61/225 of 2006. This was formulated at the inaugural meeting of the Diabetes In Asia Study Group in Nepal October 2008. The main aim of

this declaration was to formulate and accept preventive strategies and their interactions in order to combat the pandemic of T2DM
A unique "Life circle" approach which encompassed the contribution of preconception, pregnancy, infancy and childhood and adult life was conceived taking into consideration the interactive nature of all aetiological factors in the different stages in life. The declaration included both primary and secondary prevention with greater emphasis placed on the former as the modality of reducing incidence or prevalence in the future.
It is hoped that most member associations of the IDF will accept the principles laid down in this declaration to enhance and institute quality care taking into consideration the Stepwise approach in their national health programmes in their respective countries.

No conflict of interest

0315

Secondary prevention

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Complications of diabetes are devastating both in terms of economics and individual suffering.The cost of managing complications is 3-4 times higher than the cost of treatment.There is adequate clinical data supporting merits of 'lifestyle' intervention programs.This along with drug treatment has shown significant reduction in complications of diabetes.
The UKPDS & DCCT studies have also shown that tight control helps to prevent microvascular complications. It is a well recognised fact that macrovascular disease and diabetes are 2 faces of the same coin, have a 'common soil', which predisposes an individual to both these conditions and the main culprit is faulty nutrition. Hence its correction appears to be the most logical step towards prevention of complications.
Statagies of secondary prevention: In keeping with the philosophy of the UN resolution,the Khatmandu Declaration has given clear cut guidelines which support a multifactorial, multisectorial & multidiciplinary approach to diabetes care.The multisectorial approach advocates the concept of total care in every aspect of the patients health, education, agriculture,sports mental & spiritual environment. Multidiciplinary approach involves participaton of healthcare professionals,patients, relatives, Government organisations, NGO's, religious leaders,celebrities and the industry.
Lifestyle modification: The role of nutrition cannot be underestimated. There is a strong evidence supporting this method of intervention in lifestyle modification.The present epidemic of type 2 DM and the macrovascular complications are due to faulty diets containing high amount of refined carbohydrates and omega-6 fatty acids.Diets rich in omega-6(n6) fats derived from so called 'heart friendly' 'cholesterol reducing' vegetable seed oils which have high n6 content and high n6/n3 ratio, along with depletion of anti-oxidants and absence of n3 fatty acids are the major risk factors which can be easily corrected by switching over to cooking media which have low n6/n3 ratio such as ghee, coconut or olive oil.Avoiding fried, processed, preserved, refined food and energy dense drinks can certainly help managing type 2 DM.

No conflict of interest

WEDNESDAY 21 OCTOBER

SYMPOSIUM

CLINICAL RESEARCH

Novel therapeutic approaches to prevention and management of type 1 diabetes

0316

Why hasn't islet transplantation worked?

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Islet transplantation is a potential cure for type 1 diabetes. However, the rate of graft failure remains high, despite use of non-glucocorticoid based immune suppression. Thus, understanding mechanism(s) by which transplanted islets fail remains a critical question. While immune-mediated islet destruction is still possible, it is less common than before and has highlighted the importance in islet transplant failure of non-immune mechanisms.
Since aggregation of the beta cell peptide islet amyloid polypeptide (IAPP or amylin) as amyloid is associated with the loss of beta cells in type 2 diabetes, we have focused on islet amyloid deposition as another potential non-immune mediator of islet transplant failure. The importance of this mechanism has been highlighted by the recent description of amyloid in human islets following transplantation.
To determine the effects of amyloid deposition on islet transplantation outcomes, we utilized transgenic mice expressing amyloidogenic human IAPP as a model of amyloid-prone islets. Islets from human IAPP transgenic or non-transgenic mice (the latter as a non-amyloidogenic control) were transplanted into streptozocin-diabetic syngeneic recipients. Mice were followed for one or six weeks after transplantation during which time hyperglycemia recurred in recipients of human IAPP transgenic grafts but not those that received non-transgenic islets. Amyloid formed in 100% (8/8) of transgenic grafts at one week and 92% (11/12) of transgenic grafts at six weeks after transplantation; as expected amyloid was not observed in non-transgenic islet grafts. Amyloid formation was associated with a significant reduction in beta cell volume, increased beta cell apoptosis and decreased beta cell replication.
In summary, amyloid deposition is a potential non-immune mechanism underlying the failure of transplanted human islets. Since all human islets have the propensity to form amyloid, developing approaches to reduce amyloid deposition following transplantation may have beneficial consequences for beta cell preservation thereby improving glucose control.

No conflict of interest

0317

Fundamentals of stem cell therapy

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The last decade has witnessed the consolidation of "regenerative medicine" as a recognized scientific field, encompassing disciplines as diverse as cell biology, immunology, and developmental biology. Conditions thus far considered incurable suddenly appear within the reach of an ever-growing therapeutic arsenal that includes both adult and embryonic stem cells. By any measure, human embryonic stem cells (hESCs) remain the gold standard against which other stem cells are judged. The fact that adult stem cells (ASCs) are the subject of many more clinical trials than hESCs is by no means a reflection of their relative merits, as the latter were described just 10 years ago while the former have been around for more than four decades. Another misconception is that ASCs are invariably safer than hESCs, whose tumorigenic potential is well known. Recent evidence suggests that fetal stem cells (which could be considered "adult" inasmuch as they are committed to specific tissues) and mesenchymal stem cells may also develop into tumors. Here we review the advances and challenges of the prospective use of stem cells in the context of type I diabetes, an autoimmune disorder in which the insulin-producing β cells are ablated. The identification of this disease as an ideal target of regenerative therapies is based on several criteria: (a) there is only one cell type destroyed (unlike other conditions in which replacement would require complex tissue engineering involving several cell types); (b) replacement can be ectopic, as long as the transplanted cells are vascularized; and, most importantly, (c) there is already a cell-based therapy (islet transplantation) successfully used in humans. Thus, proof of principle exists that diabetes can be ameliorated by transplanting insulin-producing cells. If stem cells could be efficiently coaxed to differentiate into beta cells, their inexhaustible supply would bridge the gap between islet availability and clinical demand.

No conflict of interest

0318

Inducing antigen-specific tolerance to prevent type 1 diabetes

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Immune intervention at diagnosis of type 1 diabetes (T1D) aims to prevent or reverse the disease by blocking autoimmunity, thereby preserving/restoring β-cell mass and function. Recent clinical trials of antigen specific and non antigen specific immune therapies have demonstrated the feasibility of modulation of islet-specific autoimmunity in patients with partial prevention of loss of insulin secretion. The goal of any therapeutic intervention in T1D is the preservation of insulin secreting cells that can be achieved by the abrogation of pathogenic reactivity to beta cell autoantigens while preserving full capacity to generate a normal immune response against foreign antigens.
Two antigen specific therapies (Diape277 and GAD) will be discussed. These approaches are currently being tested in large international multicenter trials and all of them use similar outcome in terms of beneficial effect on C-peptide secretion as evidence of a therapeutic effect on restoration of β-cell function.
Immunomodulatory humanized peptide from HSP60 (p277 peptide), modified to increase its stability in vivo (DiaPep277), has shown evidence of preserving C-peptide secretion in patients with recent T1D. Interestingly, drug treatment affected the phenotype of the response to DiaPep277 in the immunized subjects with enhancement of Th2 type cytokine production. It should be underlined that C-peptide levels decreased later in time even in the treated group although less pronounced than in placebo group whereas a similar study carried out in children with T1D had no beneficial effect in preserving β-cell function or improving metabolic control. Additional trials in adult onset T1D patients seem to confirm these preliminary promising results.
Glutamic acid is transformed by glutamic acid decarboxylase (GAD) into GABA (gamma-aminobutyric acid), an important neurotransmitter. GAD exists in different isoforms including GAD65 which can be detected in pancreatic islets where it may regulate, in part, insulin release.
GAD65 is a major auto-antigen in T1D and autoantibodies appear before the onset of the disease. Recent phase II studies in man suggest that it might be beneficial in limiting the disease process in T1D. Therapy using GAD65 in an alum formulation is well tolerated without adverse side-effects. In clinical trials there was an attenuation of decline in stimulated C-peptide in the GAD65-treated group compared with controls. The mechanism of action of GAD65 is unclear but an impact on immunoregulation has been suggested. Further, in one phase II study a range of cytokines, including IL-5, IL-6, IL-10, IL-13, IL-17, IFN-ϒ and TNF-α, were higher in samples from GAD65-treated patients than in controls.
In conclusion, data obtained so far using antigen specific immunotherapy are encouraging because they showed an effect in preserving the function of beta cells without significant adverse effects.

No conflict of interest

0319

Prevention

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Immunologic, metabolic, and genetic tools are now available to identify individuals at high risk for development of Type 1 diabetes. Data from the Diabetes Prevention Trial-1 showed that first degree relatives of patients with the disease who have more than 3 positive autoantibodies or who have islet cell autoantibodies and impaired or indeterminant glucose tolerance have an extraordinarily high rate of progression to overt diabetes over a 7 year observation period. New immune therapies such as anti-CD3 or anti-CD20 antibodies, or GAD65 immunization, that have been successful in attenuating the progression of disease, may be equally or even more effective in preventing progression to overt disease since beta cell reserve is even greater in prediabetes than after diagnosis. Understanding the changes in

beta cell mass and function during the progression from prediabetes to overt disease may help design prevention strategies. We have studied changes in beta cell mass and proliferation in NOD mice during progression from insulitis to frank hyperglycemia and after immune therapy with anti-CD3 antibody. In prediabetic NOD mice there is a significant increase in beta cell proliferation, prior to a decline in glucose tolerance. Glucose is an important driver of beta cell replication because treatment of NOD mice with phlorizin decreases the rate of replication. The mechanisms controlling beta cell replication involve glucose stimulated production of VEGF by beta cells. Following treatment with anti-CD3 mAb there is striking increase in beta cell area compared diagnosis. However, the majority of "new" beta cells are those that have recovered insulin granules after anti-CD3 mAb treatment rather than proliferating cells. We conclude that during progression of diabetes, the islet inflammatory milieu and glucose can stimulate beta cell replication. The factors that control beta cell mass may suggest potential treatment strategies that, when combined with immune therapy, can prevent the disease.

No conflict of interest

SYMPOSIUM

Ectopic fat and cardiometabolic risk in type 2 diabetes - EAS/ICCR joint symposium

0320

The lipocentric pathway to hyperglycaemia and type 2 diabetes

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The lipotoxic consequences of diet-driven endogenous hyperinsulinemia are well-recognized as the cause of metabolic syndrome. Not appreciated is the fact that insulin monotherapy in type 1 diabetic patients (T1DM) may cause a variant form of metabolic syndrome dominated by high prevalence of atherogenic complications. Recent studies in our lab suggest that hyperleptinemia can restore insulin-deficient rodents to a perfectly normal life without insulin treatment. Delivery of leptin, either by adenovirus gene therapy or by infusion of the recombinant protein, maintains normoglycemia indefinitely and restores wellbeing to insulin deficient mice and rats without the need for the hyperinsulimia otherwise required. Abnormal metabolomic patterns in liver, which demonstrate marked elevations of all species of short- and long-chained acyl carnitines, are restored to normal by insulin and by leptin. However, whereas insulin simply re-esterifies the ectopically deposited fatty acids entering the adipocytes, from which they may re-emerge whenever insulin levels fall, leptin treatment, by contrast, results in ectopic fatty acid oxidation and elimination as CO_2 and H_2O. The result is a dramatic lowering of plasma and tissue triglycerides and fatty acids, with more stable reduction in short and long chain acyl carnitine species and TCA cycle intermediates as measured by metabolomic array than is achieved by insulin monotherapy. The studies strongly suggest that peripherally injected insulin can suppress glucagon and inhibit hepatic glucose production only at concentrations that greatly exceed the insulin requirements of peripheral tissues. Leptin supplementation, by suppressing both glucagon and hepatic glucose production, permits stabilization of glycemia using a markedly reduced dose of exogenous insulin; the elimination of chronic hyperinsulinemia is expected to reduce the late atherogenic and lipotoxic consequences of lifelong exogenous hyperinsulinemia and thus prevent metabolic syndrome at the end of life.

No conflict of interest

0321

Liver fat as a feature of ectopic fat and the atherogenic dyslipidemia of type 2 diabetes

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Ectopic fat is defined as the deposition of triglycerides in organs that usually contain minor amounts of fat like liver, skeletal muscle, myocardiocytes, and pancreas. Non-alcoholic fatty liver disease (NAFLD) associates with obesity, insulin resistance and Type 2 diabetes. The hallmark is excessive accumulation of triglycerides in hepatocytes. Fatty liver secretes in excess several established cardiovascular risk factors including VLDL particles, CRP, PAI-1, fibrinogen, F VII and glucose. Importantly increase of intra-abdominal fat mass is an independent predictor of the liver fat content and associates tightly with the hepatic insulin resistance. Thus fatty liver seems to be the hallmark of hepatic insulin resistance. The dynamics of fatty acid (FA) metabolism and FA sources (fluxes from adipose tissue, diet and de novo lipogenesis) play a critical role in the pathogenesis of both liver fat accumulation and hepatic insulin resistance. FAs entering the liver may be directed to VLDL triglycerides, β-oxidation or storage. The imbalance between FFA flux, β-oxidation, DNL and VLDL secretion results in fatty liver. Therefore it is not unexpected that liver fat content correlates with different component of diabetic dyslipidemia.

We have reported that large VLDL 1 particles are the principal component of VLDL species that accumulates in plasma as triglyceride level rises. Available data indicate that overproduction of VLDL 1 TG and apo B is the dominant feature of diabetic dyslipidemia. The key question is what forces drive the overproduction of VLDL 1 particles in type 2 diabetes and insulin resistance. Both intra-abdominal fat content and liver fat volume correlate with VLDL1 TG and apo B production rates in univariate analyses but only liver fat volume remains significant in multiple regression models. Thus hepatic steatosis is the proximate cause of VLDL overproduction. We also explored the relationship between liver fat and the suppression of VLDL 1 production by insulin in subjects with a wide range of liver fat volume. Insulin down regulated VLDL 1 secretion in subjects with low liver fat but failed to suppress VLDL 1 secretion in subjects with high liver fat resulting in overproduction of large VLDL 1 particles. We also reported that VLDL 1 production rate correlated inversely with LDL size and HDL cholesterol. Thus the overproduction of large VLDL1 particles initiates a sequence of events leading to the atherogenic lipid triad.

Conflict of interest:
Paid lecturing: Merck Sharpe & Dohme, Novartis, Sanofi-Aventis
Advisory board: Merck Sharpe-Dohme, Novartis, Kowa
Commercially-sponsored research: Sanofi-Aventis, Takeda, Eli-Lilly Co., Merck Sharpe-Dohme

0322

Visceral fat as a feature of ectopic fat; implications for CVD risk in diabetes

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Patients with Type 2 diabetes have a marked increase in cardiovascular disease (CVD) risk associated with dyslipidemia and increased markers of systemic inflammation. These subjects are usually obese and commonly manifest increased visceral adiposity. We evaluated the relationship between visceral adipose tissue (VAT) and lipoprotein and inflammatory markers of CVD risk in 375 subjects with Type 2 diabetes. In multivariable regression models, VAT was positively related to VLDL particle number, LDL particle number, and VLDL size; and negatively related to LDL and HDL particle size. These relationships were unchanged after addition to BMI or subcutaneous adipose tissue (SAT) to the model. Neither BMI or SAT were independently associated with lipoprotein parameters. Similar analyses showed that VAT was positively associated with MCP-1, PAI-1, ICAM-1 and VCAM-1. BMI was most closely associated with CRP. SAT was not related to the level of any inflammatory marker. In this diabetic cohort, a waist circumference of greater than 90cm for males or 85cm for females, in combination with a serum triglyceride level of greater than 177mg/dl, identified a group of diabetic patients with a significant increase in visceral fat compared to subjects matched for waist circumference. Subjects with high triglyceride and elevated waist were also more likely to have increased levels of apoB, non-HDL cholesterol, VLDL cholesterol, and lower levels of HDL cholesterol compared to subjects matched for waist alone. These results demonstrate that VAT is associated with important lipoprotein and inflammatory markers of CVD risk in subjects with Type 2 diabetes, independent of BMI, SAT, and waist circumference. They confirm that adipose tissue distribution remains an important determinant of CVD risk in Type 2 diabetes.

No conflict of interest

0323

Visceral/ectopic fat: important therapeutic targets in type 2 diabetes

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The prevalence of type 2 diabetes is showing a spectacular progression worldwide, a phenomenon largely resulting from the epidemic proportions reached by obesity. However, physicians have been puzzled by the heterogeneity of obesity as not every obese patient is characterized by chronic complications such as type 2 diabetes, hypertension and CHD. In this regard, body fat distribution, especially visceral adipose tissue accumulation, has been found to be a key correlate of a cluster of diabetogenic, atherogenic, prothrombotic and inflammatory metabolic abnormalities now often referred to as the metabolic syndrome. Such excess visceral adiposity is also associated with increased lipid accumulation at undesired sites such as the liver, the heart and the skeletal muscle, a phenomenon referred to as ectopic fat deposition. This dysmetabolic profile is predictive of a substantially increased risk of CHD even in the absence of hyperglycemia, elevated LDL-cholesterol or hypertension. For instance, some features of the metabolic syndrome (hyperinsulinemia, elevated apolipoprotein B, and small LDL particles; the so-called atherogenic metabolic triad) have been associated with more than a 20-fold increase in the risk of CHD in middle-aged men of the Québec Cardiovascular Study. Excess visceral adiposity/ectopic fat has also been shown to be a highly prevalent feature of type 2 diabetes. It is therefore suggested that the hyperglycemic state of type 2 diabetic patients may only represent the tip of a huge dysmetabolic iceberg largely explained by the high prevalence of visceral obesity/excess ectopic fat in this population of patients. Whereas glucose lowering trials in patients with type 2 diabetes have failed to report substantial effects on cardiovascular outcomes, it is proposed that the loss of visceral/ectopic fat could represent a useful therapeutic objective to reduce cardiovascular morbidity/mortality in patients with type 2 diabetes. This hypothesis should be experimentally tested in randomized trials with hard cardiovascular outcomes.

No conflict of interest

SYMPOSIUM

Intervention for prevention of type 2 diabetes: periodical or lifetime?

0324

What have we learned from long term follow-up of diabetes prevention?

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A series of diabetes prevention trials have convincingly demonstrated that lifestyle intervention and glucose-lowering therapy in people with impaired glucose tolerance can reduce progression to diabetes. An analysis of the Finnish Prevention Study has demonstrated that the effect of lifestyle intervention on risk of diabetes persists well beyond the period in which the intervention was administered. Conversely, the risk of progression to diabetes seen in people on glucose-lowering treatments reverts to that of the placebo group when the treatment is stopped. However, trials such as DREAM have shown that the effect of pharmacological treatment on the likelihood of progression to diabetes is no more than one would predict given the glucose-lowering effect of the agents involved. Thus a critical question is the long term impact of these interventions on the complications of diabetes. In the Da Qing study the long term follow up showed prolonged beneficial impact on the risk of progression to diabetes but was underpowered to demonstrate an impact on cardiovascular outcomes. This remains an important but unanswered question.

No conflict of interest

0325

Is there a role for drug treatment?

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Prediabetes defines a risk category for diabetes and represents an established risk factor of cardiovascular disease (CVD). Dysglycemia is indissolubly connected with the diseases of the metabolic syndrome. However, the risk for CVD associated with dysglycemia develops along a continuum within and below the range of cut-off limits for categories of prediabetes. Moreover relative and absolute risk for cardiovascular complications in people with prediabetes depends not only on level of dysglycemia but also on comorbitidies such as metabolic syndrome and background with presence or absence of CVD as major determinants. Therefore with a tsunami of newly diagnosed people with prediabetes a risk-adjusted decision for medical treatment is mandatory. So far data from prospective controlled intervention trials with drugs suggest that we only treat dysglycemia but do not achieve a permanent remission after withdrawal of drug treatment. Therefore safety and convenience are essential for long-term treatment.
Data from high standard intervention trials are only available for metformin, acarbose and two glitazones: rosiglitazone and pioglitazone with an average follow-up time < 5 years.
In the DPP study with metformin a relative risk reduction of 31 % was achieved whereas in the STOP-NIDDM trial using acarbose with the same criteria as for DPP the incidence of newly diagnosed diabetes was reduced by 36 %. The DREAM study with rosiglitazone reached a risk reduction of 60 % and ACT-NOW with pioglitazone of 81 % resp.
Metformin is recommended for treatment of prediabetes in the US particularly for younger obese male subjects with IFG and combined IFG/IGT.
Acarbose is the only drug with approval for treatment of IGT in 26 countries. Glitazones bear the burden of increased risk of heart failure, bone fractures in women and weight gain. The only drug with documented reduction of hypertension and cardiovascular events is acarbose in the STOP-NIDDM trial. Thus with respect to efficacy and safety, only acarbose and metformin may be considered for treatment of IGT.
Then the question is who should be treated?
There is consistent evidence from epidemiological studies that people with the combined hyperglycemia (IFG/IGT) are at very high risk for both type 2 diabetes and CVD. The same applies for people with prediabetes and the metabolic syndrome. In a secondary analysis of the STOP-NIDDM trial the number needed to treat to prevent development of new diabetes in the presence of metabolic syndrome with acarbose was 5.8.
Furthermore in the GAMI study and other prospective observational studies of patients with acute coronary syndrome, IGT was a serious independent risk factor for recurrent myocardial infarction and mortality. Therefore it seems to be reasonable that patients with background CVD and dysglycemia should be treated with acarbose or metformin to glycemic targets recommended by the IDF guidelines on management of postprandial hyperglycemia.
In conclusion people on very high risk for diabetes and cardiovascular disease e.g. those with combined dysglycemia, metabolic syndrome and/or documented CVD represent a subgroup for which medical treatment should be considered together with best efforts of life style intervention.

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0326

How to identify high risk individuals for type 2 diabetes?

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In spite of the fact that uncertainty exists on whether a screening program for type 2 diabetes will benefit individuals screen positive and is cost-effective, screening programs have been carried out for different purposes worldwide. Given that a screening program is under developing what should be taken into account. In this presentation the issues which need to be taken into account when developing a screening policy are discussed including six aspects: 1) a brief review of how diabetes is defined, and its progress from pre-diabetes to undiagnosed diabetes, its latent course and complications occurring during the period. 2) Why to initiate a screening program: to detect undiagnosed diabetes in order to provide treatment early or to provide with intervention

to prevent the development of diabetes in individuals with pre-diabetes? 3) Risk factors associated with diabetes, which may be used to characterise and classify individuals into different phenotypic groups, and thus may help to identify the groups with high-risk for asymptomatic diabetes and pre-diabetes. 4) To provide with a detailed review on screening instruments and their performance. The instruments include blood glucose tests, blood HbA1c test, blood fructosamine, urine glucose test, and risk assessment questionnaires (scores) based on either phenotypic risk factors or genetic determinants. The performance of these screening instruments will be discussed. 5) Who should be screened and how? Does the screening target at general population or at high-risk sub-population? This will determine how to implement the screening program. 6) Take home message: how to identify high-risk individuals for type 2 diabetes depends on the aim of the screening, the place and the targeted population, the capacity to carry out the screening and the capacity to treat individuals screen positive.

No conflict of interest

0327

How do we apply these results to the real world?

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Long term follow-up of lifestyle interventions among high risk persons shows persistence of delay in the development of diabetes over 10-20 years. Strategies to move these efficacy results into the real world can be divided into high risk and general population strategies – sometimes called primary vs. primordial prevention.
Several elements of individual primary prevention lifestyle strategies are important – multiple risk factor intervention on diet, physical activity, and especially weight loss. These are usually best accomplished through targeted programs that involve multiple encounters and reinforcement, with attention to barriers and individual goals. The more participation there is in a program, the better the goal achievement. This argues that limited and short term interventions will have less positive results, and some evidence bears this out.
Some 'real world' primordial translations have focused on individual behaviors, such as increasing physical activity, reduced soft drink consumption, reductions in TV watching, or modification of school lunch programs. Whether such targeted individual behavioral approaches will succeed in overall diabetes reduction is not yet clear. Several programs using existing community resources have shown promise. The pilot studies using the YMCA facilities and staff have shown significant weight loss among high risk adults. Community-based interventions in American Indian communities also show promise by linking native traditions with programs to slow weight gain in youth and promote weight loss in adults.
Governmental recognition of the importance of diabetes prevention has come largely from the European countries, most notably Finland and the EU countries through several initiatives (FIN-D2D, DE-PLAN, IMAGE). In the US, less coordinated action has occurred, due in part to lack of incentives in the health insurance industry.
Moving from efficacy trials to real world translation has been active and multifocal. Whether policy makers can prioritize diabetes prevention remains to be seen in many developed and developing countries.

No conflict of interest

SYMPOSIUM

LIVING WITH DIABETES

New technologies in the management of diabetes

0328

New technologies and aids in management

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With every advance in clinical interventions our primary responsibility is to ensure **SAFETY**. To maximize safety and success we need to work closely with our patients and their vital family members/friends that are key to the patient's diabetes management. Important people in the lives of our patients must have a basic understanding of the patient's diabetes and the products/medicines that sustain and enhance their lives.
Every new technology/aid (glucose meters/strips, insulin pumps, CGMS, diabetes management/support software…) must be determined as being "right" for each patient. Challenges with education/understanding, availability of products, cultural differences, costs, patient desire to use technology all need to be assessed before a decision is made to move forward with new technology. We must strive for the best overall balance of blood sugars with minimum glucose excursions while at the same time keeping in mind how the patient emotionally "works" with the multiple, daily diabetes challenges. Coupled with superb education there are ways to enhance a patient's success with these technologies for example: learning from great role models who use these products, having slower introductions to new technology, being part of a support group in your practice, a diabetes association or the newer electronic diabetes support groups…
For many patients, introducing technology into their diabetes management program will actually require them to focus more attention on their diabetes management than they have in the past. Patients must be willing to make the necessary changes to effectively use the technology and they must understand that it takes focused time to benefit from technology.
Successful use of technology/aids has an incredible payoff that includes significantly enhanced daily balance of diabetes realizing the fullest and most productive lives (school, careers, relationships/friendships, sports, play) while helping to ensure enhanced health throughout life.
You Are outstanding!

Conflict of interest:
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0329

Emerging new treatments in diabetes

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Emerging new treatments are under study for both the treatment of type 1 and type 2 diabetes.
Type 1 diabetes is characterised by autoimmune destruction of insulin producing beta cells. Promising studies are currently ongoing to modulate autoimmunity in early diagnosed type 1 diabetic patients. Blocking autoimmunity would result in preservation of beta cell function and endogenous insulin secretion. New technologies have focussed on the modulation of autoimmunity with antigen-specific and non-antigen-specific approaches. Studies on antigen-specific modulation, using islet specific auto-antigens such as GAD 65, peptide ligand for insulin B23, or smaller epitopes of pro-insulin are currently ongoing. Non antigen-specific approaches with Anti CD3 antiserum have clearly shown that suppression of T-cell immunity halts beta cell damage. Both approaches are promising tools to induce tolerance and reduced beta cell destruction. Trials are ongoing looking also at the long term effects of these treatments on preservation of beta cell function and immune tolerance.
In type 2 diabetes new emerging treatments are represented by new hypoglycaemic agents. Analogues of the incretin glucagon-like peptide-1 (GLP-1) and compounds devoted at increasing GLP-1 half life when secreted in the circulation have been found to improve endogenous insulin secretion and to favour weight loss, key objective in the management of type 2 diabetes, with important improvement in glycaemic control.
Other new hypoglycaemic agents are represented by inhibitors of glucose reabsorbtion in the proximal renal tubule (SGLT2 inhibitors). The use of these compounds will results in glycosuria with calories lost in the urine, consequent weight loss, and improved glycaemic control.
All these new treatments are not free from potential side effects. Side effects will have to be carefully assessed for a critical development and use of these new drugs in diabetes.

No conflict of interest

0330

Transplantation

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Diabetes mellitus causes many debilitating and life threatening microvascular and macrovascular complications. Many trials show that tight glycemic control by intensive management including insulin treatment effectively delays onset and slows the progression of diabetic microvascular complications, and also benefits macrovascular complications. However, effective medical treatment which could 'cure' diabetes is not available. Recent studies with stem cell treatment have shown promise.
A number of advances have occurred in the field of islet cell transplantation and clinical results have shown promise. The most successful mode of transplantation in patients with type 1 diabetes mellitus is transplantation of pancreas. In patients with end-stage renal disease and type 1 diabetes mellitus, simultaneous pancreas-kidney transplantation has become the therapy of choice. Clinical outcomes of this type of transplantation have improved significantly, showing long-term survival and protection from progression of complications.

No conflict of interest

0331

Regeneration of beta cells: stem cell therapy

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Improvements in islet transplantation therapy for the treatment of Type 1 diabetes have provided critical proof of principle that cell replacement therapy can allow liberation from insulin injections and freedom from hypoglycaemia in those with Type 1 diabetes. However, limitations in donor material have restricted the availability of this therapy, and patients receiving islet transplants currently require lifelong immunosuppression. There is an overwhelming demand for new sources of insulin-producing cells and a world-wide research effort is underway, focussing on the extraordinary potential of stem cells. This includes work with immature starting cell populations such as embryonic stem (ESC) cells and stem cells from bone marrow or umbilical cord blood. Continually improving protocols are being developed to drive these cells towards the formation of insulin-producing cells. However, progress is not limited to cells of embryonic or developmental origin. Recent progress has also come from studies on more mature adult stem cells (ASC), from organs including the pancreas. Driving the formation of insulin-producing cells from adult stem cells may offer a number of advantages and this is an area of world-wide research interest at present.
To generate cells which can be safely utilised in the treatment of Type 1 diabetes, the highest standards of efficacy and safety must be met. On a functional level, cell populations must have the capacity to accurately sense changes in blood glucose concentrations and respond by secreting insulin. Optimised cell populations would also ideally be able to avoid immune destruction when transplanted. These demands represent a significant challenge to researchers in the field. However, these challenges must be met if we are to utilise the extraordinary opportunity that stem cells represent. Here, we will assess progress over the last five years and critically evaluate the potential of stem cell therapy for the treatment of Type 1 diabetes.

No conflict of interest

SYMPOSIUM

EDUCATION

Novel approaches in diabetes education

0332

Shaping diabetes care from a patient's view

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The past two decades have been marked by many therapeutic advances in the treatment of diabetes, as well as an almost unanimous recognition of the professionals' need to employ modern theories of patient-centered care. Nevertheless, an alarmingly low number of diabetes patients actually follow healthcare professionals' recommendations, resulting in continually disappointing outcomes for them and their providers. A major contributor to this irony is the absence of a uniform definition of "patient-centeredness" which has enabled some professionals who truly care about their patients to believe that they are patient-centered, without having introduced any significant modifications into the way they have always approached these patients.
Health care has always contained an inescapable element of patient-centeredness as professionals have necessarily focused upon treating their perceived needs of the patient. But this simplification often overlooks the patient's own perception of his or her needs. Without that additional perspective, the efficacy of empowerment methodologies is greatly jeopardized. To correct this phenomenon, traditional diabetes education curricula must be supplemented to incorporate patients' questions and concerns, particularly at the time of diagnosis when they often have many fears, anxieties and misconceived expectations of their professionals' abilities to cure their condition. Optimally, diabetes education must address these concerns before and during the course of providing information about the clinical components of diabetes. Essential lessons include:

1. Diabetes is inherently self-managed and cannot be cured by medications or procedures.
2. Self-management's effectiveness is dramatically enhanced by a lifelong process of ongoing support and education.
3. Treatments will likely change over time.
4. Negative emotions are common and should be addressed.
5. Desired behavioral changes are best accomplished in single steps.
6. Complications are not inevitabilities.
7. Self-management is hard work.

Understanding these basic principles should better prepare patients to accept and implement their self-management responsibilities.

No conflict of interest

0333

The narrative-autobiographical approach in diabetes care and education

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The narrative approach, introduced as an educational tool firstly in the humanities, and then in medicine as a component of "Narrative-Medicine", is a method that helps understand and explain reality, considered as a complex text that can only be described starting from each person's subjective interpretations. Adding quality to the quantity-based research, the narrative approach is an effective instrument to improve our ability to describe and understand complex situations: the narration of a personal story becomes a primary source of knowledge. In this perspective, education is not only a way to transfer knowledge, but also an opportunity for individuals to reveal themselves as unique beings and to understand the real meanings they give to themselves, to others, and to the external world.
This is particularly important when illness strikes, demanding individuals to attach a meaning to their condition, re-interpreting their story, their world and their life. In this context, the autobiographical approach represents an effective way in helping patients to reveal needs and feelings related with their condition. If implemented in a group, the sharing of each one's stories adds a value to the power of self-writing.

We have used the narrative-autobiographical approach, along with self-management education, with adolescents with type-1 diabetes during summer camps. To facilitate self-writing, we adopted a step-by-step approach, and associated/integrated other communication tools. We then performed a qualitative analysis by the grounded-theory method, which has shown that the autobiographic approach had been highly appreciated by adolescents with diabetes, helping some of them to develop self-awareness, self-training and the continued discovery of each one's innermost feelings. For many it represented a safety valve to get rid of the distress and sorrow accompanying the disease. Many of the resulting changes reported after the camp reflected an increase in self-efficacy, maturity, acceptance of the disease and responsibility in self-management.

No conflict of interest

0334

Using story, writing, music and drama in patient education

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The purpose of diabetes education is to provide people with the knowledge and the skills that they need to manage diabetes well, day by day. For all learners, education is enhanced by a multidimensional approach. Story telling, drama, music and writing for example, can bring education to life and encourage reflection, personal application and insight. Education through the arts has the potential to bridge experience and understanding, to foster imagination and creativity and promote effective coping and problem solving. It is empowering. Furthermore, use of the arts provides a means for everyone to learn, cutting through differences in culture, educational background and ability, and reducing the distance between teacher and learner. It adds a more holistic and humanistic quality to our standard approach to diabetes education. Diabetes education through the arts can be used successfully with children and with adults, with individuals and with groups, in health care settings and in the community.
The aim of this session is to examine the rationale for using music, story, writing and drama in diabetes education, to provide practical examples of how various art forms have been incorporated into diabetes education in a variety of settings and to explore the feasibility of using the arts more routinely in practice. The importance of, and challenges in, evaluating the impact of the use of arts in diabetes education will be addressed.

No conflict of interest

0335

Novel approaches in diabetes education: group education, bilingual health advocates and the elderly

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Introduction: The expert patient model of lay-led peer support is widely used in diabetes but is less popular with minority ethnic groups and those with low health literacy. We tested an alternative model of peer support for limited English speakers – informal groups facilitated by bilingual health advocates, in which participants shared stories in their own language about living with diabetes. We drew on a rich literature from medical humanities on the role of the illness narrative in healing and coping.
Study design: Randomised controlled trial with in-depth process evaluation.
Methods: 158 people referred for diabetes education were randomised to attend a story-sharing group in their own language or receive structured, nurse-led diabetes education, through an interpreter if necessary. Groups were held in six languages and ran fortnightly for six months.
Outcomes: Primary outcome was UKPDS risk score. Secondary measures included attendance, HbA1c, well-being, and Patient Enablement Score. These were measured immediately after the intervention and six months later. Process measures included ethnographic observation of groups and qualitative interviews with staff and patients.
Results: There was no difference between groups in UKPDS risk score or overall well-being. Attendance and patient enablement scores were significantly better in the story-sharing groups ($p < 0.001$). Embedding the story-sharing groups into a busy public-sector diabetes service posed many challenges but since the model was very popular with clinicians, managers and patients, these were successfully overcome.
Conclusion: Sharing unstructured personal stories amongst peers produces comparable clinical outcomes to structured nurse-led diabetes education in socio-economically deprived minority ethnic groups with diabetes. Further research is needed to link this service model more closely with personalised clinical care plans with a view to impacting further on diabetes outcomes.

No conflict of interest

TEACHING LECTURE

LIVING WITH DIABETES

Prevention of type 2 diabetes and CVD: diabesity

0336

Prevention of type 2 diabetes and CVD: diabesity

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The twin epidemics of diabetes and obesity represent one of the biggest public health challenges of the 21st century. All over the world levels of obesity and diabetes are increasing. Even in the countries of sub Saharan Africa it is estimated that in adults aged 35 to 64 years diabetes is responsible for at least 1 in 20 deaths, and in countries with a high prevalence of diabetes, such as those of the Middle East, this figure rises to between a quarter and a third of deaths. In most populations studied 60 to 80% of all deaths in people with diabetes are due to cardiovascular disease (CVD). The relationship between the risk of CVD and blood glucose is continuous, rising well below the diagnostic threshold for diabetes. This means that the deaths associated with raised blood glucose are much greater than those associated with diabetes alone. This talk will provide an up to date overview of the following:

- The nature of the relationship between measures of obesity and the risk of type 2 diabetes and whether this differs across ethnic groups;
- Evidence that obesity in pregnancy, now a major problem in many parts of the world, leads to an increased risk of diabetes in the offspring and the implications of this for prevention;
- The long-term follow up of diabetes prevention trials in those at high risk and what is known of the feasibility and cost effectiveness of implementing the interventions from these trials in different parts of the world;
- Interventions that are effective in the prevention of cardiovascular disease in people with diabetes;
- The need for population wide measures, that include addressing diet, physical activity and smoking, to reduce the risk of obesity, diabetes and cardiovascular disease, and evidence on what works.

No conflict of interest

TEACHING LECTURE

FOUNDATION SCIENCE

Insulin resistance, islet ß-cells and mitochondrial dysfunction

0337

Insulin resistance, islet ß-cells and mitochondrial dysfunction

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Insulin resistance of muscle and liver and impaired insulin secretion by ß cells are typical for humans at risk of or suffering from overt type 2 diabetes. Alterations of the density and/or function of mitochondria have been described in ß-cells, skeletal muscle cells and hepatocytes. Mitochondrial function is critical for the regulation of insulin secretion and is impaired by gluco/lipotoxicity during the

development of secretion defects. On the other hand, the role of mitochondrial function in other tissues is still unclear. Human mitochondria can be studied either in biopsies or in vivo using magnetic resonance spectroscopy. Similar to findings in mitochondriopathies, fasting mitochondrial function as assessed from flux through ATP synthase can be unchanged or up to 40% lower in insulin resistant states. During insulin stimulation, ATP production nearly doubles in metabolically healthy humans but remains unchanged in type 2 diabetic humans and their insulin resistant relatives. These cohorts frequently exhibit reduced mitochondrial density in skeletal muscle. In the liver, overt type 2 diabetic humans have lower ATP production than young metabolically healthy humans which might also result from lower mitochondrial density or structural abnormalities. Age, fat mass, physical activity, plasma free fatty acids and glucose correlate negatively with mitochondrial function. However, methodological differences between studies make it difficult to decide whether reduced mitochondrial content or function accounts for reduced ATP production in insulin resistance. Inherited abnormalities seem to be related to lower mitochondrial density, whereas in overt type 2 diabetes chronic hyperglycemia and dyslipidemia could first diminish the function and subsequently density of mitochondria via oxidative stress and apoptosis.

No conflict of interest

SYMPOSIUM

HEALTHCARE AND EPIDEMIOLOGY

Models of diabetes care from around the world

0338

Model from Canada

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Canada's universal healthcare system is funded federally, but delivered provincially. Models of delivery of diabetes care therefore vary from province to province depending on the population base, the rural, urban and ethnic mix of the population, and the amount of funding dedicated to diabetes. Researchers and policy makers are increasingly able to make better-informed decisions based on the National Diabetes Surveillance System data. According to NDSS data the national prevalence of diabetes increased 24% from 2000/01 to 2004/05. In 2004/05 5.5% (~1.8 million Canadians) had diabetes, with provincial prevalence rates ranging from 4.2 to 5.7%. In Canada, 74% of people with diabetes are cared for exclusively by family physicians, yet in recent years fewer than one-third of medical students chose family medicine residencies. In addition, physicians are aging, reducing their working hours, and limiting the number of new patients. Projected dramatic increases in diabetes will therefore coincide with a dramatic decrease in physician supply, New models of care will be essential to meet the growing burden that diabetes will place on the healthcare system. Delivery systems based on or adapted from the Chronic Care Model and other quality improvement initiatives have been successfully implemented in several provinces and are associated with improvements in patient outcomes and other measures. Care provided within these models is often offered by multidisciplinary teams and is structured to improve access to information and communication between and amongst patients and their healthcare providers. An example of national model is the Aboriginal Diabetes Initiative that involves aboriginal peoples (who have 3 to 5 times the rates of diabetes than the general population) in development and implementation of holistic and culturally appropriate programs. This session will examine a selection of successful Canadian models.

No conflict of interest

0339

Model from India

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India which has the largest number of diabetic persons in the world, faces multiple obstacles in providing a comprehensive diabetes care model for the whole country. The National Health Policy in India is implemented through a three-tier system of primary, secondary and tertiary levels of health care.

Health systems in India include conventional public and private health sectors, indigenous health systems sector including Ayurveda, Sidda and similar alternative and complementary health care systems. A small segment of the working population has access to health care provided by military, railway, police and employees state insurance hospitals.

Private sector hospitals play a major role in the prevailing health care delivery systems. This sector has several Centres of Clinical Excellence meeting rigorous international standards to treat non-communicable diseases including diabetes. Rich and middle class segments of the population depend on private sector hospitals for treatment of their illnesses. Even the poor prefer the private hospitals and private practitioners unless the treatment costs are beyond their capacity to pay forcing them to get into a "debt trap".

Launch of a National Programme for Prevention and Control of Diabetes, Cardiovascular diseases and Stroke by the government has produced nation-wide interest for better management and prevention of diabetes and its complications. Health promotion through an effective communication and community mobilization through interventions at workplace and at community levels are planned. Stress is being laid on improving awareness among the public regarding diabetes and its complications. The model system has the goals of assessing the prevalence of risk factors, risk reduction for prevention and also for early diagnosis and appropriate management of diabetes. Capacity building at state levels and health promotion through effective communication and community networking are planned.

No conflict of interest

0340

Model from Africa

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Sudan is the largest country in Africa with population of 37 millions. Inspite of its good agricultural, animal and petrol resources it is still considered poor, with suboptimal health services including care for diabetic children. The incidence and prevalence of type 1 diabetes are rising and type 2 cases are increasing. Previously almost 80% were admitted with DKA with 1-2%mortality.Lack of medications, staff, monitoring and investigative facilities in addition to ignorance, poverty and difficult accessibility to health centers were all compounding factors. The Sudanese Childhood Diabetes Association (SCDA) is an NGO that was established in 2003 to help in overcoming these problems in collaboration with the government and other similar local and international bodies such as IDF and WDF. The government was convinced to provide insulin free and recently it was approved to provide free health insurance for the diabetic children and their families. The IDF has helped in securing insulin and investigations cost to some children. The WDF is funding two projects; The Sudan Childhood Diabetes Program and Integrated Management of Childhood Diabetes. Both aim at training multidisciplinary teams, improving laboratory facilities, health education including school health in establishing clinics in various states and making treatment accessible at primary care level and peripheries by mobile clinics and others. National management guidelines have also been produced. The Association also provides socioeconomic help to poor families including meters, strips, food, clothes, school fees self supportive productive projects in addition to free investigations including HbA1c.Many multidisciplinary clinics are being set in the country. A national childhood diabetes center is being built by SCDA as a referral center in addition to provision of excellent laboratory facilities, training and research. In conclusion childhood diabetes is becoming an important health problem even in developing countries and our experience has shown that cooperation between the NGOs and the government can lead to fruitful results.

No conflict of interest

0341

Model from Europe

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Despite the growing diabetes prevalence rates of some 10 percent of the adult population and the increasing cost burden of the disease, as well as the repeated calls for action from European and international health communities, the progress made by European governments in introducing national diabetes plans and improving the quality of care of the 53 million people with known

diabetes remains low and depressingly slow. The models of care – if they exist at all – are characterized by diversity. Only 13 (less than half) of the European Union (EU)'s 27 Member States have a national diabetes plan or policy framework for diabetes. Outside the EU, especially in the ex-Soviet Union countries, centralized structured care persists in many coutries. A key question is that of access to adequate care and treatment. In general, there is good access to essential diabetes treatments in countries across Europe, however access to more advanced treatments and technologies is more restrictive in a number of EU Member States, and very limited in a number of countries outside the EU. Government budget reforms are beginning to affect the availability of prescribed treatments offered free of charge to diabetes patients. There is also a growing debate in some countries around the use of health technology assessment and its potential negative impact on patient access. Structured team approach involving a diabetologist, a dietician and a diabetes educator or nurse is the gold standard of care on the level of specialised, secondary care. However, the majority of patients is primarily seen by primary care doctors. Still some countries are even missing the profession of certified diabetes educators or nurses. Disease management programmes for type 1 and type 2 diabetes have been developed in many countries to improve the quality of care at the primary care level and to bridge the gap between primary and secondary care. 20 years after the St. Vincent Declaration has set out diabetes recommendations for Europe it is high time that finally the widely recognized best practice in the prevention, care and management of diabetes are finally implemented.

No conflict of interest

SYMPOSIUM

FOUNDATION SCIENCE

Which are the in vivo sources of ß-cells ?

0342

Regeneration of ß-cell mass via endogenous progenitor activation

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Novel strategies in diabetes therapy would benefit from the use of stem/progenitor cells but whether or not adult beta cell progenitors exist is one of the most controversial issues in today's diabetes research.
From robustly injured pancreas of adult mice, we isolated a cell type with high similarity to the islet cell progenitor in embryonic pancreas. This adult multipotent progenitor cell does not divide but is able to differentiate into functional beta cells that proliferate.
We will update on new models that involve stem/progenitor cells for beta cell generation and speculate on the signals needed for their recruitment to feed into perspectives for the generation of new beta cells for transplantation and regeneration in diabetes.

No conflict of interest

0343

Differentiation potential of islet precursor cells

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Aim: During pancreatic development, islet endocrine cells originate from progenitors defined by the expression of the transcription factor Neurogenin3 (Ngn3). As a population, Ngn3+ cells are multipotent, i.e. generating different islet cell types. However, whether a single Ngn3-expressing cell is a multipotent stem / progenitor cell or on the contrary a unipotent precursor is not known.
Method: To explore this, we generated mosaic mice by labeling very few Ngn3+ cells with Cre recombinase in MADM mice. The clonal descendents of labeled cells were analyzed at birth, in young adults and in aged mice, and determined whether clusters of Ngn3+ progeny were homogeneous or not.
Result & discussion: Our observations lead us to propose a new paradigm to refocus ideas on how cell number and type must be regulated in building complete islets of Langerhans.

No conflict of interest

0344

Co-opting molecular control of cell cycle progression in the human pancreatic ß-cell for diabetes therapy

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Adult human and in rodent pancreatic beta cell replication is an unusual event. For many years, this was interpreted to mean that adult beta cell replication cannot occur. Efforts to enhance pancreatic beta cell mass by enhancing beta cell replication were viewed as unlikely to lead to therapeutic advances. However, it is now clear that adult rodent beta cells can and normally do replicate, and that this process can be manipulated and enhanced using growth factors and intracellular signaling molecules. In contrast, it is equally clear that human beta cells are different: maneuvers and mitogens that enhance rat and mouse beta cell replication have only limited effects on adult human beta cells. Ultimately, approaches to enhance beta cell replication must activate the fundamental machinery that controls cell cycle progression in any cell type, the G1/S transition step in cell cycle progression, also called "retinoblastoma pathway" or "pRb pathway". Our laboratory has focused on defining the members of the pRb pathway in rodent and human beta cells, and using these molecules to define strategies to expand human beta cell replication. Using this approach, we have comprehensively characterized the critical regulatory molecules in the rodent and human beta cell. One example is cyclin-dependent kinase-6 (cdk-6), and its partner, cyclin D_1. Whereas adult human beta cell replication rates are normally very low (~0.3% in 8 hours), addition of cdk-6 and cyclin D_1 to human islets produces an immediate and robust (13%, or 40-fold) increase in human beta cell replication, and this is accompanied by markedly enhanced pancreatic islet transplant outcomes. In this symposium, these studies will be discussed.
References:
1. *Fiaschi-Taesch … Stewart AF. **Diabetes** 58:882, 2009.*
2 *Harb ... Stewart AF. The retinoblastoma protein (pRB) and its homologue p130 regulate pancreatic beta cell turnover. **Diabetes** (in press) 2009.*

No conflict of interest

0345

Tracing the duct cells and reaching ß-cells

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While there has been progress in deriving insulin-producing cells from embryonic stem cells and potentially from induced pluripotent stem (IPS) cells, there is increased interest in using endogenous sources for beta cell replenishment. Experimental rodent models provide evidence that replication of pre-existing beta cells as well as differentiation of new beta cells from progenitors contribute to the normal, compensatory, and regenerative growth. Our data from the regeneration rat model of partial pancreatectomy led us to hypothesize that differentiated pancreatic ductal cells function as progenitors for new islets after birth, that with stimulus they replicate and regress to a less differentiated phenotype that is equivalent to that of embryonic pancreatic progenitors and these then redifferentiate to form new acini and islets. We have used three approaches to test this hypothesis. First, both mouse and human duct-enriched (and islet-depleted) cells have been shown to give rise to islet hormone-positive cells ***in vitro*** or when transplanted. Second, examination of the molecular changes in isolated duct cells after partial pancreatectomy showed that in the process of regeneration mature pancreatic duct cells do regress and sequentially recapitulate embryonic differentiation, in fact newly formed beta cells express duct markers. Third, we took a direct approach of genetically marking ductal cells using carbonic anhydrase II (CAII) as a duct cell-specific promoter in Cre-lox lineage tracing experiments. In these experiments CAII-expressing pancreatic duct cells act as progenitors that give rise to both new islets and acini after birth and after injury. This identification of at least some pancreatic ducts as ***in vivo*** progenitors for all differentiated pancreatic cell types has implications for a potential replenishment therapy for diabetes.

No conflict of interest

WORKSHOP

LIVING WITH DIABETES

Camping: positives and negatives

0346

Camping experience in Eastern Europe

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Analysis of the advantages and disadvantages of camps for people with diabetes, based on 17 years of working experience in the eastern European region

Aims:

- Organising recreational activities and training under real-life conditions.
- Psychological adaptation.
- Involving new volunteers to the organisation.
- Working with the mass media.

Methods: To promote a healthy lifestyle (healthy diet, physical activity and self monitoring).

- Promoting social activity (involving young people in the public diabetic movement, leadership and team-building; motivating the elders to clubs and supporting groups).
- Promoting a positive image of NGO.

To conduct a survey of the Diabetic Associations of 12 countries, with the aim of learning from their accumulated experience.

Results: Carrying out analysis of the information, to identify:

- Principles of forming and preparing teams (methods and ways of working with participants, developing a day-by-day and hour-by-hour plan and an algorithm for carrying out events).
- Optimal places and duration of events.
- Medical care.
- Economic aspects.
- Impact on quality of life.
- Mistakes and lessons.

Conclusions: The analysis provided the best possible guidance on how to establish camps for people with diabetes, taking into account social factors and the age of the participants. To obtain more detailed information about the problems of setting up camps, a questionnaire was sent to the organisations of countries in other regions.

No conflict of interest

0347

Camps in SACA Region

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As we all know, diabetes camps are one of the best experiences a person with diabetes can have.

It gives you the tools to learn self confidence, independence, to have fun, to notice that you are not the only one in the world with that problem.

It has shown metabolic improvements delaying its complications during development. This seems even more evident when the experience is repeated.

Uruguay was the first country in the SACA Region to do camps for kids with diabetes, dating back to 1954. At the time it was a 20 day camp with over 35 kids, an appointed doctor, a nurse and her studying group, and a nutritionist.

Nowadays we still have camps in our country getting into account the pros and cons of the times.

An investigation led by Mark Thomaz Barone and myself held last year leads to this conclusion.

The total number of camps in SACA Region is 56 and the total number of campers is 2188. According to the IDF Diabetes Atlas 2003, the prevalence of type 1 diabetes among children (0-14 years) in SACA region plus Mexico is of 43,000

Knowing the long and short term benefits of educative camps for children with diabetes, and also knowing the benefits to the community as a whole; is that we recommend this information to be known by private as well as public institutions, so that we can all give support to camps initiatives in the region and go beyond the numbers we found.

No conflict of interest

0348

Camping in the Caribbean

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Over the past twenty years, the formation of diabetic camps for children has become popular throughout the Caribbean. The establishment of diabetic camps in the Caribbean became necessary because many simply could not afford to travel every summer to the United States or other countries for the event. The diabetes camp for children gives kids the basic training on how to monitor the disease, as well as the medication in a controlled environment. Additionally, the camp keeps a record of all participants so that data can be recorded for quality control of the programme.

Although the formation of diabetic camps for children in the Caribbean has resulted in positive feedback, there has been some negative connotation as well. Some of the challenges incurred include getting healthcare professionals committed to one week of service during the programme, getting parents to relinquish their children to this new concept, as well as locating adequate facilities to host the event. In addition, sponsorship for the camps has been a challenge, as well as locating experienced dietitians for meal planning relative to diabetics.

The camp is hosted on a daily basis for one week during the summer, where participants come in during the morning hours and leave at 4:30 pm. The structure of the camp includes a series of lectures and events that are done throughout the course of the day. During a typical day at the camp, participants have their glucose levels assessed upon arrival, followed by group discussions, physical activities, lunch, and a lecture by a guest speaker, craft and the final test at the end of the day before going home. Data is collected on glucose levels, weight, height, and also how participants feel after physical activities.

Designated sites are chosen for the testing and administering of insulin during the sessions. Moreover, participants are made aware of the difference between hypoglycemia and hyperglycemia, so that they can become aware of foods that tend to have a high glycemic index level, and how to associate this with other persons relative to social issues.

Based on findings relative to the children's diabetes camp, it was discovered that participants tend to experience high and lows after lunch either from too much activities or foods too high on the glycemic index chart. Participants were coming into the camp the following morning with either high or too low levels. This occurred because they did not consume a snack before bed time or the snack was high in sugar. It was also discovered that swimming tends to help a lot with the glucose level and it was something the children enjoyed doing much more than the other activities.

In the future, better background checks must be carried out on participants because data relative to participants are not sent in by the parents, or proper medical chart on participants. There needs to be a better balance with regards to the lectures, the physical activities, and the way we utilize our time. More training needs to be done in food preparation, monitoring and the use of physical activities in maintaining proper control of their diabetes.

No conflict of interest

0349

Supporting and empowering diabetes camping initiatives

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Aims/learning objectives:

1. Understand the elements of the AYUDA Volunteer Program that empower youth to serve as agents of change in diabetes communities abroad
2. Acknowledge diabetes camps can serve as vehicle to motivate youth to live happier and healthier lives
3. Appreciate the diversity of diabetes camps throughout the world

Methods: AYUDA is a nonprofit organization that empowers youth to serve as agents of change in diabetes communities abroad. AYUDA's innovative peer learning model trains teams of international volunteers to work with local diabetes youth leaders and motivate them to live happier and healthier lives with diabetes. For over a decade, AYUDA has collaborated with local counterparts to build off of the traditional diabetes camp model and developed an innovative and proven methodology to use peer support in youth-to-youth settings. The AYUDA volunteer experience consists of: (1) cultural exchange program, (2) diabetes outreach and education activities, (3) youth empowerment and leadership training activities, (4) supporting local projects

such as diabetes camps. In 2009, AYUDA offered volunteer programs in Boliva, Dominican Republic, and Ecuador.

Results: In the past decade, AYUDA has expanded its support to diabetes communities throughout the world by creating the AYUDA Volunteer Program that has sent 200 volunteers abroad and by creating the Campo Amigo Internacional (CAI) Youth Leadership Program that has led to an international network of over 400 dedicated young diabetes leaders from 20 different countries who learn from each other to apply the experiences and knowledge gained from CAI to enhance local diabetes camps, associations and communities.

Discussion/conclusion: AYUDA's model has seen increasing demand from both international diabetes communities and interested international youth volunteers. Customized versions of AYUDA's youth to youth model have been launched in Belize, Bolivia, and the Dominican Republic as pilots to study the possibility of replicating AYUDA's model.

Conflict of interest:
Advisory board: Diabetes Education and Camping Association AYUDA

SYMPOSIUM

ASSOCIATION DEVELOPMENT

Role of associations in different environments

0350

Support group success at grass roots level and the link with the regional department of health in South Africa

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Diabetes South Africa would have been in existence for 40 years in 2009. In 1991 the first support group was started at the Red Cross Memorial Hospital for Children in Cape Town. The second group followed in 1992 in Somerset West just outside Cape Town. More groups followed over the years, there are now 35 such groups in the Western Cape, one of the 9 provinces of South Africa.

The support groups meet at various times and some meet weekly others monthly. The activities at these groups range from various speakers on diabetes problems and diets to basic first aid principle. About 4 years ago with funding from the European Union, the Regional Department of Health approached DSA with the idea to put these groups to better use. Four groups were highlighted and their leaders were put through a training course by the local university on basic diabetes management. (for lay persons)

At the meetings, the members are weighed, have their blood pressure measured as well as their blood glucose. This is recorded on sheet for each member. Basic eye testing is also carried out and those that require further intervention are then referred to the eye clinic.

There have been a number of successes for the members, with weight loss, improved blood pressure readings and Hb1AC. Those with extremely high blood glucose readings are referred back to the local clinic and doctor with the records of their readings.

Long term it is hoped that these patients will be able to collect their medication (dispensed from a central pharmacy) at the venue where they meet.

No conflict of interest

0351

Diabetes in the SACA region: current status and possible solutions

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It is intended to display information on the status of diabetes in the region that corresponds to SACA, where it has worked continuously with the various countries of the region. There have been workshops bringing together almost all countries and have reached consensus on priorities, as it has worked in each of them individually, some are more advanced than others, but all working with the same vision.

To publicize the situation of the region, the base of data from the Diabetes Atlas of IDF, which is a reliable document, and that was updated with data until 2007.

The area of the IDF SACA Region is a little over 20 million Km^2, with a population of 252 million habitants (2003). Only 5.4% of the world population lives in South America. It is the continental territory with the smallest density after Oceania.

Estimated prevalence of diabetes in the Americas, where in 2000 an estimated 35 million people suffering from the disease and increase of 64 million people who will suffer it, with prevalence from 3.1 to 8.2% in different countries in 2000, by 2025 will be a prevalence of 4.1 to the lowest 12.2%.

In the SACA region in 2007 the diabetes prevalence ranging from 14 to 6% in different countries, with higher prevalence in Central America and the countries of northern and southern South America the lowest prevalence. Some data were derived from prevalence surveys in different cities of countries.

But by 2025 the prevalence increases to 20% of the population of Central America, Hispanic Caribbean, Brazil and other South American countries were between 6 and 8%, with the exception of Paraguay are expected to maintain its current prevalence among 4 and 6% of its population.

Taking into account the number of people affected by diabetes are under the age group 20 to 79 years, we see that in the SACA region doubles by 2025 from what was in 2007. These people are still many of them economically active.

In most countries of this Region

- Prevalence data are old or they are not available.
- Some of the studies do not follow international standards.
- Data on the prevalence of diabetes complications are not available.
- Cost studies are scarce.

This data should make the work and support each other on common issues which have been detected to be strengthened, such as:

- Education and prevention at all levels
- Training of health professionals
- Working with governments
- Work with patients themselves, who are unaware of much information of interest
- That people have access to drugs and equipment
- Raise public awareness in relation to diabetes

For this, the region has begun to work, developing a strategic plan carried out through different projects according to the needs of each country. This also agrees and is working on the need to influence governments to obtain:

- Human and financial resources to effectively manage diabetes.
- The prevention and education at all levels.
- Access to early diagnosis.
- Access to supplies for the treatment and control.
- No discrimination.
- Laws for people with diabetes and at risk of it.
- National Diabetes functional, because in some countries but not have the resources.
- Diabetes is not a health priority in some countries, remain the maternal and childhood diseases.

No conflict of interest

0352

The role of the association in improving care in Russia

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Public diabetic movement goes back to 1988 in the Soviet Union (USSR).

Moscow Diabetic Society (MDS) became a pioneer and leader. Next year diabetic organizations were created in Kharkov, Novgorod, Tula and a number of other cities. It was the time when in reality people with diabetes were completely helpless under the existing public health system.

Russian Diabetic Federation (RDF), which became a fully legitimate member of IDF, was founded in 2000. More than 100 regional and interregional public diabetic organizations are currently registered in Russia. According to experts, they are the most public and active non-commercial organizations in RF.

Our goals:

- To influence the state policy related to diabetic care in order to improve life standards of each person irrespective of place of his residence and welfare.
- Lobbying rights and freedoms of people with diabetes in the Russian state and legislative bodies and RF regions; participation in activities of social councils at all levels of RF government agencies. (The model law project "Principles of socio-medical protection of people suffering diabetes", CIS inter-Parliamentary Assembly; Heads of the Governments signed

"Agreement on CIS states cooperation in the issues of controlling diabetes incidence rate"; International forum "Let's unite to fight diabetes!" in Moscow)

These documents allow us to conduct more effective dialog with government structures regarding development and improvement of medical care to people suffering diabetes.

Consequently we see:

- Not only political parties, but dynamically developing public organizations can be the basis of civil society in Russia.
- Integrated and system approach to resolving the living standard issues of people with diabetes, as well as cooperation of all government departments and medical professionals with diabetics and their family members and close ones.

The main driving powers for implementation of national diabetic issues are diabetic public unions and each patient with diabetes can and must contribute. We must concentrate on what is uniting us, as the famous saying goes "Nothing will change until you change it".

No conflict of interest

0353

Diabetes care in Anguilla: where do we go from here?

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Anguilla is the most northerly of the Leeward Islands and represents a mere 35 square miles of land. Our 15 000 citizens utilize the services of a government owned hospital and five community health centres which are all managed by the Health Authority of Anguilla.

For the past five years, services rendered to persons affected by diabetes have been guided by the Framework of the Diabetes Care Team of Anguilla.

The expanded diabetes team includes a certified diabetes educator, dietitian, physician, internist, nephrologist, endocrinologist, ophthalmologist, foot care specialist and a social worker.

At the primary level, the community health services include weekly physician clinics, diabetes education, foot care, home visits and nutritional counseling whilst at the secondary level, total patient care is coordinated.

The Diabetes Care Team of Anguilla plans to sensitize and lobby to the Government on the impact of Chronic Non Communicable Diseases (CNCDs). Implementation and monitoring of comprehensive programmes advocating preventative measures for CNCDs is the way forward. This will include additional play fields and parks designed with walking and biking trails; exercise and nutritional programmes in the workplace and other parts of the wider community.

Additionally, programmes to promote more cultivation and sale of local produce and encourage the use of local indigenous fruits will be piloted. Measures to decrease importation tax on fruits, vegetables and juices, increase importation tax on alcohol, tobacco products and sodas (high calorie beverages). Also discounted cost of medications for persons with chronic non communicable diseases will be included in the comprehensive programme.

No conflict of interest

OPEN FORUM

IDF and the UN Resolution

0354

Will the UN recognition of diabetes make a difference to the lives of our people with diabetes

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On 20 December 2006, the United Nations General Assembly passed Resolution 61/225. This landmark Resolution recognizes diabetes as a chronic, debilitating and costly disease associated with major complications that pose severe risks for families, countries and the entire world. Governments have acknowledged that diabetes is increasing at epidemic rates and is affecting all countries. It was established that if a situation with diabetes is to be managed, we need to be able to measure it, and we need to know how well it is working. Out of this came different measures and campaigns in countries worldwide in order to improve diabetes treatment and to make positive difference to the lives of people with diabetes.

In the Eastern European region, including Macedonia, there is huge room for improvement of diabetes treatment and related outcomes. What could we do and what are we doing? Firstly, we could improve the awareness about diabetes, its risk factors and complications, and do more in identifying high-risk individuals. We could take simple steps to prevent diabetes and facilitate patient-physician communication. What are we doing? Group and individual patient education is performed since 1995; numerous lectures were held to raise diabetes awareness among general population; brochures were published covering specific diabetes issues such as nutrition, foot care, sick day rules, pregnancy, acute complications. Finally, a web-based national diabetes register is implemented to learn about the current diabetes treatment and outcomes, and to help us plan the future necessary action. Together with the UN recognition of diabetes we could make a difference.

No conflict of interest

0355

Diabetes in Uzbekistan: new horizons and collaboration ways

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Aim: to assess efficacy of the National Register (NR) in children and adolescents with type 1 DM and LIFE FOR A CHILD (LFC) grant in Uzbekistan.

Materials and methods: the NR among children and adolescents with type 1 DM has been conducted since 2000. Starting from 2007 the LFC program under the IDF auspices with participation of 42 patients from Tashkent, 15 patients from Samarkand region and from 2009 with the participation of 40 patients from Andijan region has been conducted.

Results: within the period from 2000 to 2007 type I DM mortality among children and adolescents was found to decrease from the time of the NR by 99% and 84%, respectively, due to higher frequency of basic-bolus therapy by 86.4% and 83.6%, respectively, to improvement in supply with insulin in children up to 94.2% and to 94% in adolescents as well as to higher frequency of the out-patient self-control.

Within the period of the LFC program due to permanent supply with the self-control devices, pens and insulins from IFL as well as to self-education HbA1c in children in Tashkent decreased from 9.8% to 8.3%, in adolescents from 9.4% to 8.7%. Diabetic retinopathy (DR) incidence in children with type 1 DM in Tashkent was decreased by 34.7%, diabetic polyneuropathy (DPN) being reduced by 35.9%. No cases of diabetic nephropathy (DN) and physical development retardation were registered. In Samarkand region HbA1c reached 8.7% in children and 7.4% in adolescents. DPN incidence in children with type 1 diabetes mellitus was reduced by 12.5%. DR was registered in 30.7%, IV degree DN in 23%.

Conclusions: reduction of mortality among children and adolescents with type 1 DM is the evidence for properly selected strategy and tactics for conduction of the NR. Long-term carbohydrate metabolism compensation in the participants to the LFC program contributes to the reduction in microangiopathies.

No conflict of interest

SPEAKERS' CORNER

Association-goverment interaction: how to go about it!

0356

Association-goverment interaction: how to go about it!

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Government and non-profit organizations have a lot in common: they are dedicated to fulfill the need of people that share a specific preoccupation and therefore support the implementation of policies, programs, strategies and action plans to achieve collective goals and improve the well-being of a population.
Government leaders are elected by the Citizens and the association board members by their General Assembly. Both groups are mandated to manage in the best common interest and take the required decisions to do so. They shall respect the law and assume responsibilities with integrity toward those who gave them such mandate. They have a duty to report about the activities and the realization of their organization on a determined basis.
They have a lot in common but the interesting aspect of their mutual relationship is the interaction that such organizations have between each other. One will try to influence the other and the other may react positively or negatively.
Diabetes associations have a duty to advocate for the crucial needs of people living with the disease. It is in the mandate of such groups to raise the issue of the need for diabetes prevention, education, and access to the right treatment and medication. They are therefore a group of influence, and they assume the responsibility of being the voice of quality toward the political leaders to increase their understanding of the tremendous impact of diabetes for the society. The costs are extremely high but if no-one put forward those concerns, nothing will ever be undertaken by any government. Governments react to the heat. They will move if there is a push to do so. One shall never forget the old saying: ***The squeaking wheel get the oil!*** A diabetes association shall invest lots of efforts in being such a wheel to succeed in such a domain. Lobbying is educating the ones that can make a difference. Lobbying is a lengthy process to achieve long-term results.

No conflict of interest

ORAL PRESENTATION

CLINICAL RESEARCH

Clinical care improving outcomes

O-0357

Relationship between HbA1c target range and mortality in a population based study in type 2 diabetes: The Diabetes In Germany (DIG) Study

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Aims: One of the major questions surrounding HbA1c targets is the overall benefit and eventually its effect on mortality.
We aimed to answer this by evaluating the relationship between different target ranges used by IDF and ADA and mortality in a population based study in patients with type 2 diabetes in Germany.
Patients and methods: 4020 unselected patients with type 2 diabetes aged 35-80 years from 238 sites, median follow-up time 3.7 years, 2959 completed the study or died (n=175, 5.98%), 397 dropped out. Determinants of death were calculated by stepwise regression analysis.
Results: At baseline 7.6% reported previous MI, 4.3% a stroke and 6.7% coronary revascularisation summarized as major cardiovascular event (MACE). The average HbA1c was 7.0±1.2%. Out of 1033 patients with HbA1c <6.5% 6% died, the corresponding figures for HbA1c =6.5% <7% were 574 and 5.3%, for >=7% <8% 685 and 5.1%, and for >=8% 462 and 7.6% (n. s. for tendency). Stepwise regression analysis with a predictive power of 95.1% and all major risk factors revealed MACE at baseline (p<0.0001), age (p<0.0001), smoking (p=0.016), systolic blood pressure (p=0.003) and male sex (p=0.002) as independent risk factors for mortality.
Conclusions: We found no difference in mortality in relation to cut-off levels for HbA1c control in a population rather well controlled for HbA1c at average. Only those with HbA1c >=8% show a tendency for increased risk. In our study only the classical risk factors age, male sex, blood pressure, smoking and previous MACE are independent risk factors for premature death.

No conflict of interest

O-0358

Relationship between HbA1c- target value of the ADA, glycemic variability and risk of silent hypoglycemia in patients with type 2 diabetes mellitus

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According to the findings of the ACCORD study, decrease of HbA1c<7.0% was suspected to be associated with an increased risk of hypoglycemia and mortality. To avoid possible harmful effects of aggressive HbA1c control a moderate reduction to target level of 7.0 – 7.9% was recommended.
To prove the clinical relevance of this recommendation we performed an observational study with CGMS (continuous glucose monitoring system) to analyze glycemic variability and time spent at low glucose level (silent hypoglycemia, glucose< 3.1 mmol/l).
In 110 consecutive type 2 diabetics the interstitial glucose concentration was measured with CGMS over 72 h. The patients took a standardized test meal (TM) on day 2. We divided the patients in group 1 with an HbA1c<7.0% (N=65) and group 2 with an HbA1c>=7.0% (N=45). The groups were characterized as follows:

sub- group (HbA1c)	1 (<7,0%)	2 (>=7,0%)	significance
age (years)	65±7	62±10	n.s.
BMI (kg/m*)	29±4.1	33±5.5	p=0,001
duration of diabetes (years)	4.5±3.5	12.7±7.9	p<0,001
HbA1c (%)	5.8±0.5	8.3±1.2	p<0,001

The anti-diabetic therapy differed not significantly in regard to the application of insulin (55% vs. 58%) and DPP-4 inhibitors (2% vs. 7%). However, the patients in group 2 were treated more frequently with sulfonylureas (none vs. 22%, p<0.001) or metformin (43% vs. 77%; p=0.012).
We analyzed the following parameters: average glucose on day 2 (avGTM), fasting glucose on day 2 (fG), maximal glucose after the test meal (Gmax), glucose 2h after test meal (G2h), MAGE (mean amplitude of glycemic excursions) on day 2 (MAGETM), standard deviation of average glucose on day 2 (SDTM), and duration of silent hypoglycemia over 48h (Hypo48h).

sub- group (HbA1c)	1 (<7,0%)	2 (>=7,0%)	significance
avGTM (mmol/l)	6.3±1.0	9.3±2.2	p<0.001
fG (mmol/l)	5.8±1.2	8.8±2.5	p<0.001
Gmax (mmol/l)	9.3±1.9	14.4±3.1	p< 0.001
G2h (mmol/l)	7.4±1.9	12.7±3.5	p<0.001
MAGETM	2.6±1.1	4.8±2.1	p<0.001
SDTM	1.3±0.6	2.3±0.8	p<0.001
Hypo48h (min)	53.6±139.9	14.1±70.9	p=0.055

Patients with HbA1c>7% had a distinctly higher glycemic variability which may have harmful effects on the vascular wall. However, CGM revealed no significant higher risk of silent hypoglycemia in patients with HbA1c<7%. Obviously HbA1c- level is not a reliable indicator of risk of hypoglycemia.

No conflict of interest

O-0359

The strict control of hyperglycaemia in the early stage of diabetes is important in maintaining long-term glycaemic control - from a longitudinal analysis for 8 years

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Aims: Physiological condition of type 2 diabetes mellitus (T2DM), especially pancreatic b cell dysfunction, is known to be progressive, if not well controlled. In order to answer the question how and when we should start to treat the

disease intensively in maintaining long-term glycemic control, we analyzed the longitudinal clinical data for patients with T2DM and assessed clinical parameters responsible for the long-term glycemic control.

Method: Physical and laboratory examination data, and glucose lowering medications for patients with T2DM visiting our hospital have consecutively been recorded once a year for 8 years from 2001. We analyzed the changes in HbA1c and treatment for each subjects. Treatment was adjusted to achieve HbA1c <6.5%.

Results: Total 637 patients (M/F =375/262) were included in this study. The average observation period was 7.5±0.5 years. At the baseline, average age was 61.3±10.0 years, duration of diabetes 11.2±8.5 years, BMI 23.8±3.6kg/m^2, HbA1c 6.7±1.1%. BMI was not changed through the observation period. The yearly change of HbA1c was 0.03%, and the final HbA1c level (6.9±1.1%) was significantly elevated from the baseline (p =0.0002). Patients with nutrition therapy decreased in number from 192 (30. 1%) to 70 (11.0%). Patients with OAD therapy increased in number from 301 (48.7%) to 465 (73.5%). Almost half of patients received SU drug (56.5 %) at baseline. At the final, the frequency of OAD used was SUs 40.2%, glinides 22.4%, metformin 47.7%, pioglitazone 59.6%, and aGIs 35.2% for each. The frequency of patients with OAD monotherapy was significantly decreased from 49.5% to 18.3%. Patients who required insulin therapy increased in number from 186 (29.7%) to 236 (37.0%). The change of HbA1c in each period after the onset of diabetes was 6.3±1.0 to 6.7±1.3% in 5 years or less (n=164, p <0.0001), 6.8±1.2 to 6.8±1.0% in 5-10 years (n=136, NS), 7.0±1.1 to 7.1±1.0% in 10-20 years (n=183, NS) and 7.0±1.0 to 7.1±1.1% more than 20 years (n=95, NS).

Conclusion: Our results demonstrate that glycemic control deteriorates with the progress of diabetes duration, and strongly suggest that a strict control of hyperglycemia in the early stage is required to maintain the long-term glycemic control.

No conflict of interest

O-0360

Clinical practice guidelines dissemination strategy

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Background: The Canadian Diabetes Association developed the 2008 Clinical Practice Guidelines for the Prevention and Management of Diabetes in Canada, an internationally recognized evidence-based set of clinical recommendations for the prevention of type 2 diabetes and management of type 1 and type 2 diabetes. An expert committee of 99 volunteers from various healthcare professions across Canada developed the Guidelines. The Dissemination and Implementation Committee, a volunteer group of various healthcare professionals and people living with diabetes developed the dissemination strategy.

Aims: The Association's goal in developing the Guidelines is to improve the quality of care for people with or at risk of diabetes by translating evidence-based knowledge into recommendations of care for healthcare professionals and encouraging the incorporation into practice.

Methods: The dissemination strategy included a media release, with the launch of the Guideline to raise the profile and communicate key recommendations. The strategy also includes rolling out key themes from the Guidelines, every 6 months for the next three years. Each theme consists of clinically orientated, practical information and accompanying tools to help integrate diabetes prevention and management strategies from the Guidelines into practice.

Results: The first theme, cardiovascular disease (CV) resulted in the creation of several innovative 'tools' distributed to over 100,000 healthcare providers including physicians, diabetes educators, and allied health care professionals.

The first is a branded portfolio designed as an information repository for health professionals to store essential content of the ***Guidelines***.

The second is a synopsis of key information on CV disease and diabetes.

The third is a clinical assessment tool providing an algorithm for cardiovascular risk assessment.

The fourth is self-assessment tool for lay individuals to keep and perform a self-analysis of their CV risk and to inform them of the key measures to lower this risk. This tool is expected to reach over one million Canadians with diabetes.

Lastly, the 'What's up?' document is a conversational newsletter apprising health care providers of the key elements of the 2008 ***Guidelines*** and important changes from the previous Guidelines.

Conclusion: The development of the 2008 Clinical Practice Guidelines, along with these dissemination and implementation strategies will effectively contribute to knowledge translation for health professionals to improve their care of people with diabetes. The Association intends to evaluate the effectiveness of the Guidelines and the dissemination and implementation strategies on behavior change, patient care and empowerment as these strategies unfold over the next 3 years.

No conflict of interest

O-0361

Diabetes control and management in Senegal: results of the Diabcare project

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In Senegal, as in other parts of Africa, diabetes epidemiology is poorly documented and a reliable baseline status is fundamental to allow proper management as well as the implementation of a prevention programme. For this reason the DIABCARE-Africa project has been implemented aiming to provide simple yet standardised information from thousands of patients recruited from numerous centres all over Africa (Kenya, Tanzania, Ghana, Nigeria, Cameroun, Senegal). This project is designed similar to the Europe and Asian Diabcare and is a collaboration between Novo Nordisk Regional Office Africa and Gulf, the IDF and the participating African countries. It supports the aims of the Diabetes Declaration Africa through which the IDF, WHO and the African Union call on governments of African countries to prevent diabetes and related non communicable diseases.

The present reports results of the Diabcare-Senegal project. The main objective was to describe diabetes control and management, as well as the stage of late complications observed in diabetic patients who are under follow up and treatment. A descriptive study has been conducted in 5 centres specialised in diabetes management over a period of three months. All patients being followed up in the so called centres for more than 12 months have been included. There were 387 patients with a mean age of 52.2 +/- 12.4. Diabetes was type 2 mainly [92.5%] with a mean duration of 7.1 +/- 5.6 years. Main complications were neuropathy [26.3%], eye complications [20.5%], and diabetic foot [5.1%].

Almost half of type 2 diabetic patients [46.3%] were free of any antidiabetic pharmacological agents. For patients under treatment, most [44.3%] were treated with OAD monotherapy while 10.1% were under insulin monotherapy and 5.2% under combination of OAD and insulin. Despite the frequent association of central obesity, HBP, dyslipidemia very few patients were treated for those comorbidities.

Glycaemic targets with HbA1c < 7% and <6.5% were achieved in 47.4% and 40.2% of patients respectively. Mean levels of HbA1c, FPG and PPPG showed moderate control (7.6 ± 2.4 %, 8.4 ± 4 mmol/L and 10.5 ± 5.5 mmol/L respectively) but the majority of patients failed to achieve glycaemic targets as defined by ADA or IDF.

Only 36.9% of patients treated for high blood pressure achieved the goal and 49.1% untreated patients presented nevertheless blood pressure values beyond recommended targets. Similarly, only 8.4% received treatment for dyslipidemia while 60.4% of patients presented HDLc below 1 mmol/L.

Pharmacological management of diabetes in Senegal should be implemented earlier and be more aggressive including treatment of both hyperglycaemia and associated cardiovascular risk factors. Prevention should aim for reduction of complications through a better glycaemic control.

No conflict of interest

O-0362

Comparison of the clinical management of type 2 diabetes in Canada's First Nations peoples to national guidelines: the CIRCLE study

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Introduction: Diabetes mellitus (T2DM) is one of the most common causes of morbidity and mortality in developed nations, with much of the burden due to complications of T2DM. In Canada, approximately 7% of the population has T2DM with rates up to 5 times higher in Aboriginal peoples. Despite the "epidemic" status of T2DM in Canada's First Nations (FN) peoples, there is no national data about diabetes care delivery and adherence to published national clinical practice guidelines (CPGs) for T2DM.
Aim: The aim of the Canadian First Nations Diabetes Clinical Management Epidemiologic (CIRCLE) study was to examine the degree to which the clinical status of T2DM in FN peoples across Canada was in accordance with the Canadian Diabetes Association 2003 CPGs.
Methods: A random chart audit for T2DM care during the 2007 calendar year was completed for 733 consenting patients (>= 18 years) from 15 FN communities using systematic computerized data collection. Metabolic status, prevalence of complications and treatment were documented.
Results: Results are compared to the key CPG recommendations for the treatment and management of T2DM and the degree to which patients surveyed met these CPGs. Results indicate that 33.2% [95% CI 29.0-37.4] had an A1C of 7.0-8.9% and 27.1% [19.1-35.1] had an A1C of 9.0% or greater. Of the 27.1% of patients with an A1C of 9.0% or greater, 87.6% [83.6-91.5] were not receiving insulin. Blood pressure was above the target 130/80 mmHg in 51.3% [44.7-57.9] of patients, with 13.4% [10.3-16.4] of those not on an ACE or ARB at the time of audit. LDL cholesterol was above the 2.0 mmol/L target for 65.8% [58.9-72.7] of patients, with 37.7% [28.9-46.4] not on a statin. Overweight, defined as a BMI of 25-29.9 was prevalent in 24.3% [18.6-30.0] of patients, 25.7% [19.4-31.9] were obese with a BMI of 30-34.9 and 30.3% [19.6-40.9] were morbidly obese with a BMI of 35 or greater. The prevalence of current smokers was 39.4% [19.0-49.9].
Conclusion and discussion: The CIRCLE study demonstrates that a considerable proportion of T2DM FN patients in Canada are not well controlled and that disease burden is high. The percentage of patients not at A1C target is higher than in a similar study carried out with the non-Aboriginal population in Canada. Major care gaps exist in the management and treatment of T2DM patients in FN communities. Further research into alternate models of diabetes health care delivery in FN communities are urgently required.

No conflict of interest

O-0363

ADVANCE-ON: A Post-Trial Observational Study

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Background: Globally, the prevalence of diabetes continues to rise sharply. Three recently completed large-scale clinical trials failed to confirm anticipated beneficial effects of intensive blood glucose lowering on cardiovascular events in patients with diabetes. Even more recent data suggest that the benefits of intensive glucose control strategies may accrue late and that follow-up of these trials may have been insufficient to address this crucial clinical question.
Objective: The primary aim of this study (ADVANCE-ON) is to define the long-term, post-trial effects of intensive glucose control with a gliclazide MR-based regimen (targeting an HbA1c =6.5%) compared to standard glucose control, on death and major macrovascular events in 11,140 high-risk patients with type 2 diabetes who took part in ADVANCE. Secondary aims are to determine the long-term, post-trial effects of routine blood pressure lowering with a fixed combination of perindopril-indapamide on the same 2 outcomes.
Methods: All consenting surviving patients randomised in the ADVANCE trial (from 213 active clinical centres in Australasia, Asia, Europe and North America) will be observed for five years after their final ADVANCE study visit, in the setting of their usual care. It is anticipated that the patterns of glucose control in the randomised groups will converge early after completion of the trial and cessation of the randomised interventions. Vital status and major clinical events will be documented at annual follow-up. The two primary outcomes will be death from any cause and major macrovascular events (non-fatal myocardial infarction, non-fatal stroke and cardiovascular death). Assuming a conservative annual event rate of 2.3% the study will have more than 80% power (with a=0.05) to detect a 13% or greater difference in relative risk for the primary outcomes. The effects of the interventions will be explored jointly and separately for events recorded during ADVANCE and ADVANCE-ON and tested using Cox models and log rank tests using the intention to treat principle.
Conclusion: The evidence provided by the ADVANCE-ON study, representing a contemporary cohort of patients with long standing diabetes from around the world will either confirm or refute the UKPDS post-trial findings in patients with new onset diabetes, and play a pivotal role in defining future clinical management for tens of millions of individuals with type 2 diabetes worldwide.

Conflict of interest:
Paid lecturing: Sophia Zoungas, John Chalmers, Michel Marre, Diederick Grobbee, Pavel Hamet, Stephen MacMahon, Bruce Neal, Anushka Patel, Bryan Willimas and Neil Poulter have received lecturing fees from Servier.
Advisory board: John Chalmers and Michel Marre for Servier
Commercially-sponsored research: John Chalmers and Stephen MacMahon hold research grants from Servier as principal investigators for ADVANCE.

O-0364

Cardiovascular (CV) risk evaluation in people with type 2 diabetes (T2D) on insulin therapy (CREDIT) study – CV disease and CV risk at baseline: the Italian subgroup analysis

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Insulin treatment improves long-term glycemic control, which can reduce the risk of CV events associated with T2D. The Cardiovascular Risk Evaluation in people with T2D on Insulin Therapy (CREDIT) study is a long-term (4-yr), 314 center, non-interventional trial in North America, Europe and Asia with 22 Italian participating centers. People with T2D (n=417) who had recently started insulin (basal, short-acting or premix insulin at the physician's discretion) were eligible for evaluation (60/40% male/female; age (mean±SD) 63.5±9.5 yr; BMI 29.3±5.4 kg/m2; diabetes duration 12.9±8.4 yr). Most (64.3%) had =1 diabetes-related complication; macrovascular disease was present in 32.9 %. At the time of starting insulin, A1C and plasma glucose (PG) levels were high (A1C 9.1±1.8 %, fasting BG 207.1±69.7 mg/dL, postprandial BG 229.9±68.5 mg/dL). 39.5% of T2D patients in this study were obese (BMI >30.0 kg/m2), while 9.6% had low-density lipoprotein cholesterol = or >160 mg/dL and 41.1% had triglycerides = or >150 mg/dL. While the lipid profile and obesity varied with increasing A1C category, other risk factors including hypertension and smoking were comparable between categories. Thus, in this Italian population with T2D, despite a high prevalence of macrovascular disease, the delay in starting insulin therapy and the high A1C level were associated with poor management of other CV risk factors, suggesting a common problem in managing metabolic risk.

Conflict of interest:
Advisory board: Vespasiani G.: Sanofi-aventis Novo-Nordisk Roche Diagnostics.

ORAL PRESENTATION

Complications - macrovascular

O-0365

Prevalence and outcomes of unrecognized diabetes mellitus and prediabetes among acute stroke patients with admission hyperglycaemia at the Philippine General Hospital: DASH Study

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Retrospective study by Gacutan showed 21% admission hyperglycaemia at Philippine General Hospital. Screening for glucose disorders among hyperglycaemic stroke patients is a venue for secondary prevention. Stroke Society of the Philippines has no screening guidelines for post-stroke hyperglycaemia.
Objectives: To determine prevalence and outcomes of unrecognized diabetes and prediabetes among stroke patients; determine predictors for unrecognized diabetes.
Methodology: Cross-sectional prospective.
Population: Stroke patients from January-December 2008 with admission hyperglycaemia. RBS, HbA1c &NIHSS taken on admission. All were followed up 6-weeks post-discharge for screening (using FBS &75-grams OGTT) except those discharged with anti-diabetes medications.
Outcomes: Mortality at 6 & 12 weeks. Functional outcomes (Modified Rankin & Barthel's Index) done at OPD follow-up.
Results: There were 504 stroke patients, 178(35%) with admission hyperglycaemia. Nineteen were unclassified (10 patients with unkown DM history expired and 9 lost to follow-up). Majority were newly-diagnosed diabetes 32.7%(52 of 159), stress hyperglycaemia(29.56%), IGT(13.8%), IFG(8.8%), IGT+IFG(3.7%), previous diabetes(11.32%). By Kruskal-Wallis, diabetic stroke patients were older(67.78±13.15years), higher BMI(25.44±4kg/m2), higher waist/hip ratio (0.97±0.18), higher admission NIHSS(21±7) compared to other groups. Alcohol, smoking, hypertension, nosocomial infections were associated with diabetes($p<0.01$) using Fischer Exact's test. No association for sex and atrial fibrillation. By Kruskal-Wallis, admission RBS was higher among diabetics compared to prediabetics and stress hyperglycaemics(180±6 vs. 147±46 vs. 133±27, p0.001); HbA1c was higher among diabetics versus other groups respectively(8.4±2.4 vs. 5.43±0.6 vs. 4.8±0.5, p0.001). Higher triglyceride and lower HDL seen among diabetics versus stress hyperglycaemia. No trends for cholesterol and LDL across groups. On multiple logistic regression, age(OR:1.06,p0.07), smoking(OR:9.81,p0.05) & HbA1c(OR:11.39,$p<0.01$) were predictors for unrecognized diabetes. Higher Modified Rankin score and lower Barthel's index (indicative of poor motor function) were seen among diabetics compared to other groups measured on follow-up. Mortality at 6 weeks was higher among diabetics(OR: 2.34,$p<0.01$) and trend towards higher mortality at 12 weeks(OR:1.81,p0.063) compared to other groups.
Conclusion: Thirty-five percent of stroke patients had hyperglycemia; majority were unrecognized diabetes. Using FBS and 75-grams OGTT 6-weeks post-discharge, we identified 32.7% new diabetics and 26.4% prediabetics eligible for treatment and secondary prevention. Mortality was higher with diabetes. Age, smoking, HbA1c were predictors of newly-diagnosed diabetes.

No conflict of interest

O-0366

Trends in cardiovascular risk factors in patients with type 2 diabetes

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Aims: To study the trends in cardiovascular risk factors in a clinic population of patients with type 2 diabetes over seven years period.
To evaluate the impact of introduction of National institute of clinical excellence (NICE) United Kingdom (UK) guidelines in the treatment of type 2 diabetes.
Methods: Design: Sequential analysis of the patients data was undertaken from the Wirral diabetes register database with comparison against national United Kingdom guidelines targets.
Setting: Outpatient diabetes clinic in a university teaching hospital foundation trust UK.
Participants: All patients with non-insulin dependent diabetes entered into Wirral diabetes register between 2000 and 2006 (seven years).
Main outcome measures: The following parameters were analysed; systolic and diastolic blood pressure, glycosylated haemoglobin (HbA1c), total cholesterol, triglycerides, high density lipoprotein cholesterol and low density lipoprotein cholesterol.
Results: Between 2000 and 2006 a progressive decline can be observed in mean total cholesterol from 5.1mmol/l to 4.3 mmol/l ($p<0.001$) and mean low density lipoprotein cholesterol from 3.6 mmol/l to 2.2 mmol/l ($p<0.001$).
There is a marked drop in mean population blood pressure readings from 147/86 mmHg in 2000 to 137/75 mmHg in 2006. The mean blood pressure of the sample has been lower than 140/80 mmHg since 2003, reflecting National Institute of Health and Clinical Excellence (NICE) UK guideline targets.
In 2006 41% of patients have HbA1c value of <7% compared 42% in 2000. There is also an overall fall in the percentage of patients with HbA1c >9% from 19% in 2005 to 15% in 2006. However improvement in HbA1c over seven years period in all the percentage group were not significant compared to the improvements seen in lipid and blood pressure control.
Conclusions: This study demonstrates a clear downward trend in blood pressure and lipid values. This trend is not seen to the same extent in HbA1c values in the clinic population studied, reflecting changes in treatment targets. Although NICE UK guidelines and targets for the treatment of type 2 diabetes appear to have had a significant effect on blood pressure and lipid parameters in this population, there is no evidence of significant improvement in glycaemic control. It is likely that more intensive intervention or more potent therapies will be needed to improve glycaemia in patients with type 2 diabetes mellitus. Importantly we would expect the lowered lipid levels and blood pressure to reduce future risk of cardiovascular disease in this population.

No conflict of interest

O-0367

SIMETRIC project (metabolic syndrome as cardiovascular risk factor): correlation of diabetes and metabolic syndrome with cardiovascular disease in a ten-years follow-up

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Aims: To analyze prevalence of metabolic syndrome (MS) in assisted population >15 y. in primary care (according WHO/NCEP-ATPIII criteria) and its correlation with cardiovascular disease (CVD), a multicentric cohort study was performed (2 basic health areas (n=43,000), ten-years follow-up).
Methods: 1489 participants, that gave their informed consent, were questioned on anamnesis, risk factors, anthropometrical parameters, blood pressure, analytic profile and oral glucose tolerance test (OGTT) (except in diabetics), current treatments, presence of CVD and CVD risk scores.
Results: Mean age 52,3±17,6 y., 860 women (57,8%). 558 had hypertension (37,5%), 234 type 2 diabetes (15,7%), 359 prediabetes (24,1%), 483 obesity (32,4%), 342 dyslipidaemia (23%) and 279 smokers (18,7%). Mean BMI 27,8±5,5 kg/m^2. CVD risk score according Framingham's function was 11,2±9,8%, and according Spanish tables (REGICOR) 10,0±13,9%.
259 subjects (17,4%,[CI95%: 20,0-26,3]) fulfilled MS criteria (WHO), and 303 (20,3%,[CI95%: 26,9-32,6]) according NCEP-ATPIII criteria.
CVD was observed in 212 individuals (14,2%): 88 nephropathy (5,9%), 76 coronary events (5,1%), 68 stroke (4,6%), 53 peripheral arteriopathy (3,6%), 32 retinopathy (2,1%) and 8 neuropathy (0,5%). The relative risk of complications between patients with/without MS (NCEP) was 2,67.
Logistic regression of MS components on all-type CVD shows an odds ratio(OR)=2,52 (CI95%:1,7-3,6) for hypertension, OR=1,58 (CI95%:1,1-2,3) for dyslipidaemia and OR=1,23 (CI95%:0,99-1,59) for type 2 diabetes. The analysis the MS criteria by WHO-set shows OR=2,2 (CI95%:1,4-3,6) and by NCEP criteria OR=1,5 (CI95%:0,9-2,5).
Conclusions: Prevalence of MS is high in general assisted population. MS supposes a greater risk of CVD, specially by WHO-criteria (high prediction of CVD). Therefore, this confirms that detection of MS is a cornerstone in primary care.

Conflict of interest:
Other substantive relationships: JJC, Catalan Health Institute this study won a grant by Spanish Found for Sanitary Research (FIS-2006, Instituto Carlos III).

O-0368

Impact of diabetes and hypertension on the incidence of acute stroke for the DECODE study group

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Aim: We examined the impact of diabetes and hypertension on acute stroke incidence in women and men.
Methods: Data from 9 northern European cohorts were collaboratively analyzed. The study included 9985 men and 8375 women aged 25 to 90 years. The median length of follow-up was 12.9 years. A multivariable adjusted Cox proportional Hazards model was used to estimate the hazard ratios (HRs) for stroke incidence.
Results: A total of 356 (3.6%) women and 642 (7.7%) men had acute stroke event. In both genders diabetes and hypertension were independent risk factors for stroke incidence. When people without both diabetes and hypertension were used as a reference group (women and men separately), the multivariable adjusted HRs were 1.99 (1.51-2.63) in women and 1.37 (1.12-1.68) in men with hypertension but without diabetes, 1.78 (0.99-3.21) in women and 1.79 (1.08-2.98) in men without hypertension but with diabetes and 3.29 (2.28-4.76) in women and 2.54 (1.92-3.34) in men with both hypertension and diabetes. No interaction between diabetes and hypertension was found in either gender.
Conclusions: Diabetes increased the risk of stroke incidence in both genders independent of hypertension.

No conflict of interest

O-0369

Cardiovascular Function in type 1 diabetes: the DCCT/EDIC Research Group

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Background: The EDIC observational follow-up of the Diabetes Control and Complications Trial (DCCT) has reported benefit of prior intensive therapy on retinopathy, nephropathy, neuropathy and cardiovascular disease events (CVD). Using Cardiac MRI (CMRI), we evaluated cardiac function in former DCCT intensive (INT) and conventional (CON) therapy subjects 14 to 15 years after DCCT closeout.
Methods: CMRI was performed in 28 clinics and read centrally using MASS software. Six functional outcomes were evaluated: end diastolic volume (EDV) and systolic volume (ESV), stroke volume (SV), cardiac output (CAROUT) and left ventricular end diastolic mass (LVDM), adjusting for body surface area, and ejection fraction (EF).
Results: Of 1211 active EDIC subjects asked to participate, 90% agreed. A total of 850 scans (~75% of the consented participants) have been performed. Fifty-one patients with CVD were excluded from this analysis. On a quality control scale of 0,1,2, the mean score was 1.77 with only 2% unacceptable (0 score) examinations. Reproducibility was high for all measures (intra-class correlations > 0.91). Normal EF (50-70%) was prevalent (>85%) in both INT and CON treatment group.

Least Square Means by Gender (adjusting for basic covariates (BC) - reader, machine type and attained age) and by Group (adjusting for BC and gender)

Outcome	Females	Males	INT	CON
EDV (ml/m²)	66.4	74.0	70.3	70.1
ESV (ml/m²)	24.2	28.8	26.4	26.6
SV (ml/m²)	42.2	45.2	43.9	43.5
EF (%)	63.7	61.4	62.7	62.4
CAROUT (L/min/m²)	3.1	3.2	3.1	3.1
LVDM (g/m²)	66.5	80.2	73.4	73.2

*All p-values < 0.01 between genders. No significant differences between INT and CON

Conclusion: A large multicenter study of CVD in type 1 diabetes is feasible, attractive to participants and yields new information. After excluding patients with clinical CVD events, 89% of the subjects had normal EF; least square mean differences between men and women were statistically significant on all the functional outcomes; no differences were detected between the INT and CON treatment groups.

No conflict of interest

O-0370

Prevalence of cardiovascular disease in people with diabetes with and without schizophrenia: a population-based cohort study

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Aims: Individuals with diabetes have a high prevalence of cardiovascular (CV) risk factors and cardiovascular disease (CVD), as do individuals with schizophrenia. It is unclear, however, whether the prevalence of CVD is further increased in people with diabetes and schizophrenia. The aim of this study was to evaluate prevalence of CV risk, CVD, and revascularization procedures in people with diabetes and schizophrenia compared to people with diabetes only.
Methods: A population-based cohort study was used to evaluate the study aim. Information from the databases of Alberta Health and Wellness was used to create the cohort, and included all individuals aged 20 years and older in the Canadian province of Alberta with diabetes from 1995 to 2006. Individuals with diabetes were identified using criteria from the Canadian National Diabetes Surveillance System. Schizophrenia, CV risk (hypertension, dyslipidemia), CVD (congestive heart failure [CHF], stroke, acute coronary syndrome, ischemic heart disease, arrhythmia, old myocardial infarction), and revascularization procedures (coronary artery bypass grafting, percutaneous transluminal coronary angioplasty) were identified using physician claims data, ambulatory care data, and hospitalization data. Prevalence of CV risk, CVD, and revascularization was compared using multivariable logistic regression while adjusting for differences in age, sex, healthcare subsidy, and number of physician visits (to control for surveillance bias).
Results: We identified 129,438 people with diabetes, and 2,261 (2.0%) of these individuals had schizophrenia. Individuals with diabetes only were older (mean age 60.3 years vs. 57.6 years), more likely to be male (51% vs. 42.9%), and less likely to have subsidized health care (39.6% vs. 73.3%) compared to individuals with schizophrenia and diabetes. After multivariable adjustment, prevalence of dyslipidemia was not significantly different between groups (OR: 0.97; 95% CI: 0.89 - 1.05), and hypertension was less prevalent in people with diabetes and schizophrenia (OR: 0.60; 95% CI: 0.55 - 0.65). Individuals with schizophrenia and diabetes were more likely to have CHF (OR: 1.31; 95% CI: 1.18 - 1.46), stroke (OR: 1.27; 95% CI: 1.14 - 1.42), and CVD (OR: 1.19; 95% CI: 1.10 - 1.30), but were less likely to undergo revascularization (OR: 0.51; 95% CI: 0.41 - 0.63).
Conclusion: Despite having a higher prevalence of CVD, individuals with schizophrenia and diabetes were significantly less likely to undergo revascularization compared to people with diabetes only. Also, prevalence of CV risk factors was lower (hypertension) in people with diabetes and schizophrenia, or no different (dyslipidemia) between groups. This may be due to a lack of screening, or other lifestyle risk factors increasing the risk of CVD in those with schizophrenia and diabetes.

No conflict of interest

O-0371

Sex-specific incidence of cardiovascular disease and coronary artery calcification according to type 2 diabetes mellitus – results of the Heinz Nixdorf Recall study

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Aims: Diabetes mellitus type 2 (DM) is known to be associated with atherosclerosis and increases the risk for cardiovascular disease (CVD). Coronary artery calcification (CAC), a specific marker of coronary atherosclerosis, predicts CVD. Here we examined the gender distribution and impact of CAC by diabetes status on incident CVD in a population-based cohort.
Methods: Out of 4,814 study participants of the Heinz Nixdorf Recall Study (aged 45-75 years), we included 4,301 participants without overt CVD at baseline and with data for CAC, diabetes and with information for myocardial infarction/coronary death (primary endpoint). Baseline examination included detailed standardized medical history, blood analyses and electron-beam tomography. Prevalent DM is based on selfreport and/or intake of diabetes medication. CAC, measured as Agatston score, is presented as median and interquartile range (Q1-Q3) and transformed to log(CAC+1) in regression models. We calculated hazard ratios (HR) and 95%-confidence intervals (95%-CI) for primary endpoints with Cox proportional hazards models adjusting for covariates age, CAC, BMI, blood pressure and anti-hypertensives.
Results: The mean observation time was 5.02 (±0.77) years, with 94 (65 men) events, including 17 participants (11 men) with DM. Highest CAC was documented in men with events, with a median CAC in men with DM of 663 (Q1-Q3:1,721), without DM 210 (918). In men without events these figures were 108 (420), resp. 47 (202). In women without myocardial infarction/coronary death and no DM the known distinctive lower CAC burden compared to men is reflected in a median CAC of only 1.3 (32). Even in women with events and DM the CAC is still lower compared to men (28;1,228). Nevertheless, the high CVD risk for women with DM is also apparent in our study with an age-adjusted HR of 3.65 (95% CI: 1.42-10.72) compared to women without DM (men 2.03 (1.02-4.01)). Adjusting for covariates did not change the HR in women (3.90;1.42-10.72), but in men the HR decreased considerably (1.49;0.72-3.08). Stratifying for DM revealed that in men with DM, an increasing CAC is associated with an increasing risk for myocardial infarction/coronary death (age-adjusted HR log(CAC+1): 2.01;1.18-7.71), different to women with DM (1.24;0.8-1.8). However, in both men and women without DM the risk according to CAC burden did not differ (1.46;1.25-1.71, resp. 1.41;1.17-1.70).
Conclusions: Coronary artery calcification plays an important role for CVD risk in men with DM, while CAC seems to be of less importance to explain the increased CVD risk in women with DM. However, these results have to be confirmed in studies with more events, especially with regard to women with DM.

No conflict of interest

ORAL PRESENTATION

Alternative therapies: efficacy metabolism, trials

O-0372

Treatment of obesity and diabetes by a Canadian aboriginal medicinal plant in a mouse model of diet-induced type 2 diabetes

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The prevalence of the metabolic syndrome is increasing among the Cree of Eeyou Istchee (CEI - Northern Quebec) as a result of increases in obesity and insulin resistance. Non-traditional diet and sedentary lifestyle along with cultural disconnect of modern type 2 diabetes (T2D) therapies are involved. Exploring treatments from within CEI traditional pharmacopeia represents a valuable alternative. W7, a CEI plant extract from the Canadian Boreal Forest, demonstrated anti-obesity and anti-diabetic properties in a recent in-vivo prevention study. We thus evaluated the potential effects of two preparations (aqueous (AE) and ethanolic (EE) extracts) of this plant in a mouse model of diet-induced obesity and T2D. C57/BL6 mice were subjected to high fat (HF) diet for sixteen weeks resulting in obesity, hyperinsulinemia and mild steady-state hyperglycemia. Plant extracts were introduced in the HF diet for the last eight weeks and tested at doses of 125 and 250 mg/Kg as the in-vivo prevention study. Treatment with EE 125 was found to have the most significant effects. It significantly decreased body weight by 13% and retroperitoneal fat pad weight by 16% as compared to HF control mice. No statistical difference was observed in water or food intake. In EE 125 animals, plasma insulin was significantly diminished by 87 % compared to HF controls. Area under the curve of glycemia versus time was also reduced in treated animals and statistical significance was reached in the EE 250 group (15% reduction) as was the ratio of insulinemia to glycemia (64 % by EE 250 and 85% by EE 125). The effectiveness of EE 125 was also related to a decrease in the lipid content of the liver, as confirmed by histological analysis revealing a significant reduction in the proportion of steatotic livers and a shift toward more moderate grades of steatosis as compared to HF controls. The relative liver weight was significantly reduced by 20 % by EE compared to HF controls. Moreover, treatment of animals by EE 125 significantly diminished plasma leptin by 41 % and leptin/adiponectin ratio by 42 % compared to controls. Plasma TNF-a increased by 800 % in HF controls and was returned to normal values by treatment with each plant extract (AE and EE). The treatment of animals with AE 125 demonstrated a profile of effects similar to EE125 but lower effectiveness. These plant extracts thus exhibit promising anti-obesity and consequently anti-diabetic effects. Mechanisms remain to be elucidated but current results point towards a stimulation of metabolic rate.

Conflict of interest:
Other substantive relationships: Funded by the Canadian Institutes of Health Research

O-0373

Mechanisms underlying the vasorelaxant effect induced by Anacardium occidentale L. leaf fraction in rat small resistance mesenteric arteries

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Background: Anacardium occidentale L. (Cashew tree) of the family Anacardiaceae have been documented as traditional plant treatment for diabetes and hypertension.
Aims: To investigate vasorelaxant effect of the cyclohexane-soluble of Anacardium occidentale leaf (AOL1), the dichloromethane-soluble (AOL2), the Ethyle-Acetate soluble (AOL3) and the methanol-soluble (AOL4) in resistance mesenteric arteries isolated in normal Wistar rats. We also hypothesized that reducing the prooxidant parameters in high glucose-induced endothelial

dysfunction in human endothelial cell line (EAhy) by these fractions could improve endothelial function.

Methods: Total antioxidant activity of cashew leaf was determined using DPPH free radical scavenging assay and results were expressed in gram trolox equivalent (TE)/gram of extract. Assessment of vascular function was carried out on second-order mesenteric arteries isolated and incubated in 5 ml organ bath containing physiological saline. EAhy cells were cultured under normal (5.5 mmol/l) or high glucose (20 mmol/l) concentrations for 4 and 7 days with or without extracts of AOL (7 µg/ml, 12.5 µg/ml and 25 µg/ml).The activity and expression of protein kinase C, NO synthase and antioxidant enzymes, namely, superoxide dismutase, catalase and glutathione peroxidase were investigated.

Result and discussion: The most potent antiradical reactivity was observed in AOL4 extract, a methanol-soluble fraction with 2023 TE/g of extract compared to chlorogenic acid (2976 TE/g of extract) as standard. In isolated mesenteric artery rings precontracted with phenylephrine, AOL1, AOL2, AOL3, and AOL4 induced a concentration-dependant relaxation with IC50 values of 120 µg/ml, 100 µg/ml, 70 µg/ml and 70 µg/ml, respectively. Exposure of Eahy cells with high glucose for 7 days significantly ($p<0.05$) decreased cell viability (22%), the level of antioxidant gluthatione and expression of protein kinase C. Incubation with low concentrations (7 µg/ml, 12.5 µg/ml) of AOL3 and AOL4 for 7 days significantly ($p<0.05$) attenuated high glucose-induced dysfunction of EAhy cells. HPLC-DAD profile recorded for AOL3 and AOL4 indicates the presence of for major peaks with close retention times.

Conclusion: ***Anacardium occidentale*** leaf extract induces a NO- and endothelium vasodilatation in mesenteric arteries precontracted with phenylephrine. Particularly, AOL3 and AOL4 improved high glucose-mediated endothelial dysfunction and thus may be potential new therapeutic agents for diabetic cardiovascular complications.

No conflict of interest

O-0374

Effects of Mongolian traditional medicinal plant extract on in vivo insulin action in streptozotocin-induced diabetic rats

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Aims: In the present study, we firstly performed a preliminary investigation on the acute effect of Mongolian medicinal plant extract Myricaria alopecuroides on the blood glucose tolerance in rats, evaluated by an oral glucose tolerance test (OGTT). Then, investigated the effects of the same extract on in vivo insulin action in streptozotocin (50mg.kg^{-1}BW,i.v.) -induced diabetic rats by means of the euglycemic clamp.

Methods:

Oral glucose tolerance test (OGTT).
Rats were randomly divided into control and plant extract (PE) groups (6-13 rats per group).Time-course blood glucose concentrations were determined 30, 60, and 120 min after glucose load.

Whole blood and plasma assays
Blood glucose concentration was determined using an automated analyzer model 2300 STAT Plus. Plasma insulin concentration was measured by the Special Reference Laboratories Inc. using a chemiluminescence enzyme immunoassay method.

Statistical analysis
Data were analyzed by one-way analysis of variance. When a significant difference was found ($P < 0.05$), values were further compared with Student's t test. The StatView was used for statistical analyses. Data are expressed as means ± SE.

Results:

1. Effect of plant extract on blood glucose concentrations
   Blood glucose concentrations and net incremental area under the curve (net AUC) for control and plant extract before and after oral load of glucose are summarized in Table1, ($P<0.05$).
2. Acute effect of plant extract on MCR
   Rats divided into acute and 7-days oral administration groups. At low–dose insulin infusion, the decreased metabolic clearance rates of glucose (MCR) in diabetic rats were improved by a single and 7 days administration of plant extract (500mg.kg.BW, p.o.; acute effects: control: 8.6± 0.7ml kg^{-1}min^{-1}. versus plant extract: 15.4 ± 1.4 ml kg^{-1}min^{-1}, and 7-days effects: control: 8.2 ± 0.6 ml kg^{-1}min^{-1} versus plants extract: 16.5 ± 1.2 ml kg^{-1}min^{-1}, $P<0.001$, respectively).
3. Effect of 7-day administration of plant extracts on MCR
   During high-dose insulin infusion, the MCR was increased in 7-days ***Myricaria*** extract treated diabetes compared with saline diabetes, but, these changes were not observed after a single ***Myricaria*** extract treatment.

Discussion: Outcomes from the euglycemic clamp studies indicated that (1) impaired insulin sensitivity induced by STZ was improved by single and 7 days administration of plant extract Myricaria alopecuroides (impaired MCRs of diabetic rats were ameliorated by 80% and 95% as a result of single and 7-day treatment, respectively) and (2) 7-day treatment with plant extract improved insulin responsiveness in diabetic rats.

Conclusion: These results suggest that a single administration of the Mongolian plant extract can improve glucose utilization and insulin resistance in diabetic rats.

Conflict of interest:
Paid lecturing: O.Khookhor, Aichi Gakuin University
Stock ownership: O. Khookhor, Aichi Gakuin University Japan and Institute of Chemistry and Chemical -technoglogy, MAS, Mongolia
Advisory board: Department of Health science, Aichi Gakuin University
Employee: senior researcher
Commercially-sponsored research: Japan diabetes society
Other substantive relationships: Mongolian diabetes association

O-0375

The CIHR Team in aboriginal antidiabetic medicines: a community-based collaborative approach uniting healers and biomedical scientists to validate Cree traditional medicine

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Obesity and Type 2 diabetes are considered global epidemics by WHO. Aboriginal people such as the Cree of Eeyou Istchee (James Bay area of northern Quebec) are particularly affected and suffer greater complications. This may be due in part to low compliance with modern medicines because of a cultural disconnect. A multidisciplinary team was therefore put together to explore the antidiabetic potential of Cree Traditional Medicine (TM) involving Boreal forest plants. The team is composed equally of scientists with expertise in botany, phytochemistry, nutrition, pharmacology, biochemistry, toxicology and clinical endocrinology, as well as Cree Elders and members of various Cree health institutions, notably including the Cree Board of Health and Social Services of James Bay (CBHSSJB). A novel ethnobotanical approach based on diabetes symptoms was used to identify potential antidiabetic plants, and a total of 17 species were characterized phytochemically. Each species was screened for primary antidiabetic activity using 1) a pancreatic beta cell line to assess effects on glucose-dependent insulin secretion; 2) muscle and adipocyte cell lines to assess effects on insulin-dependent and -independent glucose transport; 3) an adipocyte cell line to assess glitazone-like activity; 4) an intestinal cell line to assess effects on glucose transport. Secondary antidiabetic activity screening included 1) protection against hyper- or hypoglycaemia in a pre-neuronal cell line; 2) pro- or anti-inflammatory activity in a macrophage cell line; 3) anti-oxidant and anti-glycation activity using cell free bioassays. Toxicological potential was also assessed by using an array of recombinant cytochrome P450 isoforms (CYPs) and other flavin-containing oxygenases. No species affected insulin secretion but several plant extracts increased basal and/or insulin-dependent glucose transport in muscle cells, adipocytes or both, while inhibiting intestinal glucose transport and exhibiting weak to moderate inhibition of CYPs. For such promising species, detailed studies uncovered a predominant mode of action related to inhibition of mitochondrial respiration and activation of AMPK, similar to metformin. For several of these species, active principles have been identified using bioassay-guided fractionation. Bioavailibility, antihyperglycemic and/or anti-obesity efficacy has been confirmed for 4 plants using in vivo animal models of obesity, insulin resistance or diabetes. Clinical studies are also underway to document the safety and efficacy of Cree TM using a culturally-adapted, all-inclusive, observational protocol. Finally, our project represents a pilot study for the integration of Cree TM into diabetes care for the CBHSSJB.

Conflict of interest:
Other substantive relationships: funded by the Canadian Institutes of Health Research

O-0376

A Gymnema sylvestre extract stimulates insulin secretion from isolated human islets of Langerhans in vitro: role of extracellular Ca2+ and protein kinase activation

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Background: Folk remedies such as Gymnema sylvestre (GS) plant extracts have been used to treat diabetes mellitus for many centuries, but their direct effects on insulin secretion and mode of action have not been studied in detail.
Methods: We have used isolated human islets to examine the effects of a novel GS extract, termed OSA (U.S. Patents 6949261 and 6946151), on insulin secretion and to investigate whether the stimulatory effect of OSA in human islets is dependent on the presence of extracellular calcium and protein kinase activation.
Results: Basal insulin secretion from human islets at 2mM glucose was stimulated by 0.25mg/ml OSA (347±16% basal, P<0.0001, n=3), and OSA also potentiated insulin secretion at 20mM glucose (20mM glucose: 352±44% basal, 20mM glucose + 0.25 mg/ml OSA: 863±77% basal, P<0.0001, n=3). OSA-induced insulin secretion was significantly inhibited by nifedipine, a voltage-operated Ca^{2+} channel (VOCC) blocker (2mM glucose + 0.25mg/ml OSA: 665±32% basal; + 10mM nifedipine: 370±9%, P<0.001, n=4). The insulin secretagogue effect of OSA was dependent, in part, on protein kinase activation since incubating human islets with staurosporine, a general protein kinase inhibitor, resulted in partial inhibition of OSA-induced insulin secretion (2mM glucose + 0.25mg/ml OSA: 673±27% basal; + 200nM staurosporine: 485±19%, P<0.0001, n=4).
Conclusions: These data indicate that the GS isolate OSA stimulates insulin secretion from human islets in vitro, at least in part as a consequence of Ca^{2+} influx and protein kinase activation.

No conflict of interest

O-0377

Antidiabetic activity of cycloart-23-ene-3ß, 25 diol in streptozotocin-nicotinamide induced diabetic mice

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Aims: Cycloart-23-ene-3β, 25-diol was isolated from stem bark of Pongamia pinnata. The aim of the study was to evaluate the antidiabetic activity of cycloart-23-ene-3β, 25-diol in streptozotocin-nicotinamide induced diabetic mice.
Methods: Overnight fasted mice were treated with nicotinamide (110 mg/kg, i.p.). After 15 min, streptozotocin (200 mg/kg, i.p.) was injected. Increase in blood sugar after 3 days confirmed diabetes. After one week, diabetic mice were divided into following groups (n=6) viz; Group II- vehicle (tween 80, 2%; 10 ml/kg, p.o.), Group III- glibenclamide (10 mg/kg, p.o.), Group IV- cycloart-23-ene-3β, 25-diol (1 mg/kg, p.o.). Group I was separate non diabetic. Acute study involved determination of serum glucose at 0, 2, 4, 6 and 24h. Chronic study include daily administration for 28 days of cycloart-23-ene-3β, 25-diol and glibenclamide. Serum glucose, body weight, food intake and water intake were determined on 7th, 14th, 21st and 28th day. On day 28th the following parameters were determined; haemogram, lipid profile, liver function, renal function in serum. Oral glucose tolerance test (OGTT) was performed in cycloart-23-ene-3β, 25-diol pretreated mice on day 29. On 30th day, all animal were sacrificed by cervical dislocation. Organs were removed from animals for histopathology.
Results: Cycloart-23-ene-3β, 25-diol (1 mg/kg) and glibenclamide (10 mg/kg) showed significant reduction in serum glucose level in acute and subacute studies. The antihyperglycaemic effect was onset at 2h and peak effect at 6h. In chronic study, maximum reduction in serum glucose level was observed on 28th day. Levels of WBC, cholesterol, triglycerides, urea level, uric acid, albumin, globulin, ALT, AST and LDH were higher in the vehicle treated diabetic mice, but were controlled by cycloart-23-ene-3β, 25-diol and glybenclamide. Drug treated groups showed no significant elevation of HDL. Other parameters were not significantly different in all groups. Body weight, food intake and water intake was not affected in treated groups. Increased glucose utilization was observed after 28 day treatment in OGTT. Microscopic examination of liver, kidney, heart and spleen revealed alterations in vehicle treated group, which were less pronounced in cycloart-23-ene-3β, 25-diol and glibenclamide treated groups.
Conclusion: These findings indicated the antidiabetic activity of cycloart-23-ene-3β, 25-diol.

No conflict of interest

O-0378

Qei-Fu-Di-Huang-Wan on metabolic control in type 2 diabetic subjects - double-blind placebo-controlled study

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Aims: In STZ-diabetic rats, acute oral administration of Qei-Fu-Di-Huang-Wan (QFDHW) decreased the plasma glucose level and very similar to that of metformin treatment. Oral administration of Fu-Zei, the individual constituents of QFDHW, reversed the elevated mRNA and protein levels of PEPCK in the liver of STZ-diabetic rats. The aim of this study is to investigate the efficacy and safety of QFDHW on metabolic control in Type 2 diabetic patients.
Methods: In this randomized, double-blind, placebo-controlled trial, 23 patients were assigned to receive oral QFDHW 4gm thrice daily for 3 months, and 27 patients were assigned to receive placebo. At entry and at 1, 2 and 3 months, glycemic control (fasting plasma glucose and HbA1c), blood pressure, BMI and lipid profiles were measured.
Results: At study entry, patients in the two groups well matched for age, gender, BMI and glycemic control. After 3 months, there was a 8.2% difference (p<0.05) in fasting plasma glucose and a 5.8% difference (p<0.05) in HbA1c between this two groups. The most frequent adverse events in patients receiving QFDHW were upper respiratory infection, musculoskeletal pain and epigastric discomforts. No treatement-related side effects were noted.
Discussion/conclusions: QFDHW had significant effect on metabolic control in Type 2 diabetic patients.

No conflict of interest

ORAL PRESENTATION

LIVING WITH DIABETES

Primary prevention of type 2 diabetes

O-0379

Prevalence metabolic syndrome in a young urban population in Sri Lanka with risk factors for cardio-metabolic disease: DIABRISK SL - stage 2

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Background and aims: Metabolic syndrome (MS) defines subjects at increased risk of metabolic and cardiovascular disease. The prevalence of obesity is growing worldwide in particular among young children and adults. This study aimed to evaluate the prevalence and clinical relevance of MS and its components in children and young adults from an urban Sri Lankan population.
Methods: A general population screening of 22,577 (10,612 M, 11,965 F) subjects aged between 6-40 years estimated the prevalence of physical inactivity, family history of type 2 diabetes, raised body mass index and raised waist circumference. Those subjects with two or more of these risk factors were further assessed for clinical and biochemical measures in the fasting state and after an oral glucose tolerance test. The IDF definition for MS in children and adults was used.
Results: To date 4109, (46% M) subjects selected for increased risk have attended; 1398 (45%M) between 6-14 years, 751 (33%M) between 15-19 years and 1960 (52%M) between 20-40 years of age. Obesity (waist>90 percentile for subjects under 16yrs,=>90cm M and =>80cm F) was detected in 70.7%, raised triglycerides (=>150mg/dl) in 19%, low high density lipoprotein

(HDL) [<40mg/dl for M and <16yr and <50mg/dl for F] in 47.8%, raised blood pressure (systolic and diastolic blood pressure =>130 and =>85mmHg respectively or on anti-hypertensive therapy) in 16% and abnormal fasting venous plasma glucose (=>100mg/dl) in 9.1% of the cohort. Below 16 yrs; M>F for prevalence of obesity, low HDL and raised triglycerides (p<0.005 for all). Above 16 yrs; F>M for prevalence of obesity and low HDL and M>F for raised blood pressure, raised triglycerides and abnormal fasting glucose (p<0.005 for all). Below 16 years of age MS was diagnosed in 12.9% of males and 8.7% of females and over 16 years MS was diagnosed in 29.1% of men and 18.9 % of women (M>F p<0.001 for both). Overall 54 (1.3%) subjects had impaired fasting glycaemia, 307 (7.5%) impaired glucose tolerance and 74 a new diagnosis of type 2 diabetes mellitus (1.8%).

Conclusion and discussion: In this sample of children and young adults with 2 or more simple indicators of cardio-metabolic risk there is a high prevalence of MS and its individual components. The effect of intensive [3 monthly] vs. non intensive [12 monthly] non pharmacological intervention with life style modification on cardio-metabolic endpoints is currently under evaluation in a 3 year prospective clinical trial. This study will assist in the development of low cost interventional strategies and cardio-metabolic risk scores for this population.

Conflict of interest:
Other substantive relationships: Diabrisk SL is supported by a BRIDGES Grant from the International Diabetes Federation. BRIDGES, an International Diabetes Federation project, is supported by an educational grant from Eli Lilly and Company

O-0380

Metabolic status, insulin resistance and insulin secretion function in first-degree relatives of type 2 diabetic patients in Sichuan province of China

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Background and aims: To investigate the metabolic status, insulin resistance and the islet ß-cell secretory function in the first-degree relatives(FDR)of type2 diabetic patients.

Materials and methods: This is a cross-sectional study.Subjects were divided into 559 first-degree relatives(FDR) of type 2 diabetic patients and 1750 controls without positive family history of Diabetes.Afer oral glucose tolerance test(OGTT), 318 FDR and 1348 controls were defined as NGT-FDR group and NGT-control group.Blood pressure,weight,waist,blood glucose,lipids and insulin were measured.HOMA-IR and HOMA-ß indexes were used to evaluate insulin resistance and beta-cell function.The insulin sensitivity index(ISI) and glucose diposition index(DI)were also used to evaluate insulin resisitance.

Results: (1) HOMA-IR increased, ISI and DI decreased in FDR group when compared with control group(p<0.05).The incidence of co-existed three or above metabolic disorders and the risk of metabolic syndrome were higher in the FDR group than that in controll group(p<0.05).In both groups,HOMA-IR increased, DI and ISI decreased as the number of co-existing metabolic disorders increased(p<0.05).(2) In NGT-FDR group, HOMA-IR and HOMA-ß increased, ISI and DI decreased when comparing with those in NC group(p<0.05).The incidence of co-existing three or above metabolic disorders were higher in the NGT-FDR group than that in the NC group(p<0.05). In NGT-FDR group,HOMA-ß was lower in subjects with one metabolic disorder than those without any metabolic disorder(p<0.05). In normal control group,as the number of co-existing metabolic disorders increased, HOMA-IR increased, DI and ISI decreased.Furthermore,HOMA-ß was lower in subjects with two metabolic disorders than those without any metabolic disorder(p<0.05).

Conclusion: Metabolic disorders occur more frequently in FDR of diabetic patients than individuals without family history for type 2 diabetes.It is necessary to provide early preventive interventions of the metabolic index including diabetes.

No conflict of interest

O-0381

Sustained gains from a primary care based Diabetes Prevention Program

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Aim: The Greater Green Triangle Diabetes Prevention Project (GGT DPP) was a national demonstrator implementation trial of a group-based lifestyle modification program undertaken in an Australian primary health care setting in 2004-2006. Participants were followed up for a further 18 months to examine the sustainability of the changes achieved, and the effectiveness of a structured telephone intervention in maintaining these changes.

Methods: Subsequent to the 12 month GGT DPP, 168 participants aged 40-75 years were followed for a further 18 months, receiving either telephone support (n=67) or self-care only (n=101), and re-assessed using anthropometric, clinical, psychological and general health measures.

Results: No significant differences between the telephone support and self-care groups were found on major clinical outcomes during the 18 month follow-up; therefore results have been pooled. Compared with baseline, thirty months after beginning the original intervention, mean waist circumference decreased by more than 4 cm, and significant improvements were also found in weight, diastolic blood pressure, oral glucose tolerance, HDL- and LDL-cholesterol, and the SF-36 v2 measures of bodily pain, general health, and vitality. Total cholesterol and triglycerides significantly improved both during the initial 12 month intervention and 18 month follow-up. Some measures of mental health, notably depression, regressed to baseline levels. Fasting plasma glucose worsened during the 18 month follow-up resulting in an overall increase of 0.23 mmol/L by comparison with baseline.

Discussion/conclusion: We believe that the present study is the first to report on an 18 month follow-up of participants involved in a "real world" group diabetes prevention program. Most of the improvements from baseline seem to be maintained over this period. Sustained benefits from a diabetes prevention program can be reproduced in a primary care setting for individuals at high risk of T2DM.

No conflict of interest

O-0382

Effect of lifestyle intervention on the metabolic syndrome subjects with impaired glucose tolerance during 3 years: Kanagawa diabetes prevention program

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Aims: Metabolic syndrome, MetS is well known to be one of major risks for development of diabetes. Many previous studies have reported that lifestyle intervention seems to be effective for MetS subjects, but there had been scant data regarding the effect of lifestyle intervention on MetS subjects with IGT, comparing with that on non-MetS subjects with IGT. Thus, we performed a randomized controlled trial, such as lifestyle intervention in order to examine the changes of various laboratory findings, including response of blood glucose and insulin levels to oral glucose tolerance test, in Japanese MetS and non-MetS subjects both with IGT before and after the intervention.

Methods: After getting informed consent, we randomly assigned 29 subjects with IGT to two groups, such as a usual care control group and a lifestyle modification group under the special program, requesting intensely at least a 7 percent weight loss or maintaining modest weight with walking with at least 10,000 steps per day. At baseline the latter group was furthermore divided into two subgroups; 9 subjects with MetS or 9 subjects with non-MetS. The mean age of the subjects was 49 years, and the mean body-mass index (the weight in

kilograms divided by the square of the height in meters) was 25.0; 10 percent were women. In MetS and non-MetS groups, changes (percent) in clinical and metabolic parameters were evaluated and compared before and after the intervention. The diagnosis of diabetes required only one test. All comparisons were performed using two tailed tests wih a nominal significance level of 0.05. Statistical analyses were performed using SPSS version 13.0(SPSS, Chicago, IL).
Results: The cumulative incidence of diabetes which was newly diagnosed after starting the present study was 27.3 percent in the usual care control group and 11.1 percent in the lifestyle modification group, respectively. The lifestyle intervention reduced the incidence by 59 percent as compared with the control group. In MetS subjects, the number of metabolic risk factors decreased significantly (12.9 percent,p=0.046), compared with that in non-MetS subjects who showed significantly a decrease in body weight (4.6 percent, p=0.028), body fat(17.2 percent, p=0.028),2-h plasma glucose(28.8 percent, p=0.028),and the number of metabolic risk factors(68.9 percent, p=0.025).
Discussion/Conclusion: Lifestyle changes could reduce the incidence of diabetes in subjects possessing some of metabolic risk factors. Moreover, clinical and metabolic parameters were much more greatly improved in non-MetS subjects than in MetS subjects.

No conflict of interest

O-0383

Comparison of various maternal anthropometric markers of obesity for identifying metabolic syndrome in offspring

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Background: Several maternal anthropometric markers have been associated with the metabolic syndrome (MS) in offspring.
Objectives: a) to determine the association between children's MS and maternal anthropometric markers such as BMI, waist circumference (WC), WC/ height, weight/sitting height squared, WC/ sitting height, and b) to compare the abilities of these 5 indices to identify children with MS.
Methods: Data were collected cross sectionally from 5 elementary schools between April 2007 and March 2008. Data for BMI, WC, WC/height, weight/ sitting height squared, WC/sitting height were performed in mothers and their children. Sitting height was compared with total height to predict MS. Tanner stage, blood pressure (BP), fasting serum concentrations of glucose, lipids and insulin were measured in children. Criteria analogous to ATPIII for MS were used for children.
Results: Over 624(307 males) children aged 8.96 ± 1.86 y and their mothers aged 36.25 ± 7.14 y were examined. 107 (17.1%) of children were obese (OB) (BMI>95%ile per CDC norms), and 95 (15.2%) overweight (OW) (BMI>85<95%ile).One hundred and ninety (30.4%) of mothers were OB (BMI>30 kg/m2), and 206 (33.0%) OW (BMI>25<30). Approximately 68% of the children were pre-pubertal. The prevalence of MS was 3.5% overall, 6.7% in OW and 13.9% in OB children. Mothers of children with MS had mean values of anthropometric markers which were significantly higher than those for the mothers of children without MS: BMI (32.96 vs 28.12; p=0.01); WC (100.81 vs 90.57cm, p=0.01); WC/height (0.64 vs 0.57, p=0.006), WC/sitting height (1.20 vs 1.07, p=0.009); and weight/sitting height squared (115.25 vs 98.13, p=0.030). To determine which marker was a better predictor for MS, a ROC curve was generated for maternal BMI, WC, WC/height, weight/sitting height squared, WC/sitting height, with children's MS as the dichotomous variable. The areas under the ROC curves were 0.697 ± 0.07 for BMI, 0.698 ±0.07 for WC 0.717 ± 0.07 for WC/height 0.725 ±0.07 for WC/sitting height and 0.704 ± 0.07 for weight/sitting height squared. There was not a significant difference between the areas of the five maternal anthropometric markers as predictors of MS in their children.
Conclusions: Measurement of maternal sitting height had no advantages over total height in the prediction of children's MS. Maternal BMI, WC, WC/height, weight/sitting height squared, WC/sitting height identified children with MS. This study suggests that any of the five maternal anthropometric markers could identify the MS in their children consistent with known familial associations of obesity and type 2 diabetes.

No conflict of interest

O-0384

Factors associated with altered fasting plasma glucose in a population of young adults

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Introduction: Glycemia alterations are important predictors for the development of type 2 diabetes mellitus (DM) and also for cardiovascular diseases which, when associated with DM, will compromise its prognosis and control even more, resulting in the worsening of the patient's quality of life and increasing the costs for the health system. The present study aimed to determine the frequency of fasting plasma glucose alterations in young adults and analyze the factors associated to these glycemic changes.
Methodology: This descriptive, cross-sectional study is part of a cohort study of children in Ribeirão Preto, Sao Paulo state, Brazil, born between June 1st 1978 and May 31st 1979. An exploratory analysis was carried out, calculating the gross odds ratio, after which a multiple logistic regression model was used, as the answer was binary (glycemia ≥ 100 mg/dl and < 100 mg/dl). The study was approved by the Research Ethics Committee.
Results: The frequency for fasting plasma glucose alterations (glycemia ≥100 mg/dl) was 3.1%, higher for male (4.5%) when compared to female (1.8%) gender. The gender and abdominal circumference variables remained in the final model, with an adjusted odds ratio of 2.5 (1.29-4.81) and of 4.74 (1.34-16.79), respectively. The effect of the family history among first-degree relatives, a variable that can express the genetic component associated with DM, as well as the levels of fasting plasma insulinemia and blood pressure levels, had their effects annulled by the presence of obesity-related variables.
Conclusion: The frequency of glycemic alterations was significant and it can also be concluded that gender and abdominal circumference are independently associated variables for fasting plasma glucose alterations in young adults participating in this study.

No conflict of interest

O-0385

A two-step risk stratification tool to identify persons at risk for cardiovascular disease and type 2 diabetes in primary care - The Hoorn Study

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Aim: Since strategies for prevention of cardiovascular disease (CVD) and type 2 diabetes (T2DM) largely overlap, we developed a tool that predicts the combination of end-points. To fit into current primary care practice, for the general population, we developed a questionnaire to identify those at high risk for the combined end-point, and investigated whether a clinical model improved risk stratification.
Methods: The study population consisted of 1258 participants, aged 50-75 years, from the Hoorn Study who had an OGTT at baseline in 1989 and at the follow-up examination in 1996, and who had complete follow-up information on CVD morbidity and mortality until 1996. All were free of prevalent CVD or known T2DM at baseline. The predicted outcome was a composite end-point of cardiovascular disease morbidity and mortality (ICD-codes 390-459), sudden death (ICD-code 798) or T2DM. Logistic regression analysis with backward selection was used to develop both models. The questionnaire was developed in the general population and the clinical model was developed in those at high risk according to the questionnaire. Discrimination was assessed by the area under the receiver operating characteristic curve. In the high risk group, risk classification of the models was compared by calculation of net reclassification improvement.

Results: During 6.4 years of follow-up, 375 out of 1258 persons developed the composite end-point. For the risk questionnaire, age, sex, waist circumference, use of anti-hypertensive medication, history of gestational diabetes, family history of T2DM, myocardial infarction or stroke, shortness of breath during walking and current smoking were selected as predictors. Discrimination of the risk questionnaire was 0.74 for the composite end-point. The separate outcome measures were equally well predicted (data not shown). A cut-off at optimum sensitivity and specificity, considered 44% of this elderly population as having high risk; 48% of these indeed developed the end-point. For the clinical model in the high risk group, age, current smoking, family history of stroke or myocardial infarction, glucose, HDL- and total cholesterol and hypertension were the most important predictors. Discrimination of this model was better as compared to the questionnaire (data not shown), and the clinical model improved classification in 9% of those who developed the outcome and in 11% of the cases who did not develop the outcome ($p<0.01$).
Conclusion: In the general population, risk of CVD and T2DM can be predicted by one single risk questionnaire which is useful for public health purposes. For those at high risk, subsequent blood testing and blood pressure measurement which is needed for treatment decisions, can contribute to further refine risk prediction.

No conflict of interest

O-0386

Development of a European action plan for the prevention of type 2 diabetes

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Background: The UN Resolution for Diabetes in December 2006 acknowledged type 2 diabetes as a serious threat for the world's health and asked for national and international political action especially to improve prevention in this field. Both the WHO Global Action Plan for non-communicable diseases (2008-2013) and the Together for health strategy of the EU Parliament (2008-2013) have continued to define this topic as very important on the health politics agenda of all - industrial and developing - countries. Nevertheless, until today only a few countries have taken active steps, e.g. by developing a National Action Plan for Diabetes, to change the political and financial framework in order to facilitate the implementation of diabetes prevention programs. As the experiences in the pilot phase of the EU project IMAGE (Development and Implementation of a European Guideline and Training Standards for Diabetes Prevention) have shown, in most countries there are people who would like to offer high quality prevention programs but the implementation is inhibited by the missing support for and through the health care system.
Therefore the Diabetes Prevention Forum, the prevention initiative of IDF Europe, has decided to compile a European Action Plan for the prevention of type 2 diabetes to define the most important cornerstones of action on a European and national level.
Current status: The prepared European Action Plan names goals, areas of responsibility and partners for collaboration. The implementation of diabetes prevention action needs to involve the different levels of "health care provision" from health politics and policy making through to health care providers and also through to the general public. A first draft of the European Action Plan was presented to the members of the Diabetes Prevention Forum. This plan will be completed and presented to and endorsed by European Institutions like WHO, European Centre for Disease Prevention and Control (ECDC), PCDE, EURADIA, EASD, DESG and ISPAD.
Perspectives: Actions and successes documented up to now for the prevention of diabetes have been limited to ad-hoc strategies that for the most part pertain to educational measures. It would be desirable for the stakeholders to subordinate their interests to the cause itself. In the future, it will be crucial to (i) better coordinate already existing resources and potential, (ii) win over new partners, (iii) develop shared strategies that encompass many areas of society and implement them as actions. With this European Action Plan a first step in this direction is taken.

No conflict of interest

ORAL PRESENTATION

FOUNDATION SCIENCE

Normal and pathological insulin signalling

O-0387

Protein tyrosine phosphatase 1B gene expression in skeletal muscle is linked to metabolic flexibility in African Americans

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Metabolic flexibility (MF) is the ability of the body to switch from fat to carbohydrate oxidation in response to feeding or with insulin administration. Limited research studies have documented that individuals with insulin resistance have impaired MF. However, cellular factors modulating this effect are not precisely known. We sought to determine the relationship of negative regulators of insulin signaling in skeletal muscle, i.e. protein tyrosine phosphatases, on metabolic flexibility. Specifically, we evaluated gene expression and protein content of protein tyrosine phosphatase 1B (PTP1B) in skeletal muscle and assessed its relationship to MF.
Methods: Respiratory quotient (RQ) and substrate oxidation of carbohydrate and fat were evaluated by indirect calorimetry during baseline (fasting) and hyperinsulinemic-euglycemic clamp (insulin infusion of 120 $mU \bullet m^{-2} \bullet min^{-1}$) in 17 African Americans with type 2 diabetes (AA-T2D) (Mean ± SE; age, 56 ± 2 y; BMI, 32.5 ± 1.2 kg/m^2) and 16 African Americans with no diabetes (AA-ND) (age, 34 ± 2 y; BMI, 28.8 ± 2.1 kg/m^2). MF was calculated as the change from the fasting (pre-insulin) to insulin stimulated (during clamp) states (ΔRQ = clamp RQ – fasting RQ). PTP1B gene expression (assessed by rtPCR) and protein content (assessed by western blotting) were determined in skeletal muscle biopsies taken from the vastus lateralis muscle at the baseline (pre-insulin) of the clamp.
Results: PTP1B gene expression was higher in AA-T2D (mean ± SE; 1.50 ± 0.28) vs. AA-ND (0.17 ± 0.05, $P < 0.0001$). AA-T2D (0.06 ± 0.01) had lower MF than AA-ND (0.12 ± 0.01, $P < 0.0001$). During the fasting state, there were no significant differences between carbohydrate and fat oxidation. However, after insulin stimulation carbohydrate oxidation was lower in the AA-T2D (145.0 ± 6.8) vs. AA-ND (225.1 ± 11.9, $P < 0.0001$). In addition, fat oxidation was higher in the AA-T2D (32.4 ± 3.9) vs. AA-ND (5.4 ± 3.6, $P < 0.0001$). PTP1B gene expression was negatively ($P < 0.0001$) related to MF ($r_s = -0.70$), insulin-stimulated carbohydrate oxidation ($r_s = -0.65$) and insulin sensitivity ($r_s = -0.68$) whereas a positive association was observed with insulin-stimulated fat oxidation ($r_s = 0.64$). PTP1B gene expression was not associated with fasting carbohydrate and fat oxidation. Also, PTP1B protein content was not associated with any of the parameters.
Conclusion: This study demonstrated that a higher PTP1B gene expression is observed in African Americans with type 2 diabetes and the gene expression is related to lower metabolic flexibility (i.e., metabolic inflexibility). The mechanism by which a negative regulator of insulin signaling induces this clinical effect is not known, but is the subject of ongoing investigation.

No conflict of interest

O-0388

Lower postprandial branched chain amino acids (BCAA) may contribute to altered protein metabolism but not insulin resistance of glucose in men with type 2 diabetes mellitus (T2DM)

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Elevated 24h fed-fasted protein flux and 50% reduced net balance in hyperglycemic men with T2DM vs. nondiabetic men is partly explained by insulin resistance of protein metabolism. They show 12.5% lower net anabolic response to hyperinsulinemia during euglycemic (5.5mM) isoaminoacidemic (postabsorptive levels) clamps (Pereira et al, 2008). As net anabolism occurs postprandially, we tested whether protein metabolism would be further altered during an hyperinsulinemic (600pM), hyperglycemic (8mM), hyperaminoacidemic (BCAA= 700µM) clamp, with levels at peak concentrations found in lean following a mixed meal. This clamp was performed in 8 hyperglycemic T2DM (57±2 yrs; BMI: 34±2; FPG: 8.4±0.6mM) and 9 lean nondiabetic men (29±2 yrs; BMI: 21±1; FPG: 5.3±0.1mM) with glucose and

leucine kinetics measured using ^{3}H-glucose and ^{13}C-leucine infusions, after 5-6d of weight maintaining, protein controlled (1.5g/kg.d) diet. In T2DM, insulin sensitivity of glucose (endogenous glucose production: 1.7±0.4 vs. -0.2±0.1; glucose disposal: 4.8±0.6 vs. 9.2±0.7 mg/kgFFM.min) was less (p<0.005). Surprisingly, the positive net protein balance (0.88±0.10 vs. 1.00±0.09 µmol/kgFFM.min) was not different.

Therefore, we tested whether the insulin and substrate responses to a mixed meal over 5h could account for lesser 24h anabolism in T2DM. Fasting, postprandial peak, total and net area under the curve (AUC) of insulin, glucose and BCAA were measured in 9 hyperglycemic T2DM (61±4 yrs; BMI: 31±4, FPG: 7.7±0.7 mM) during a 689 kcal meal (34g protein). Results were compared to those of 9 lean and 5 obese nondiabetic with a similar protocol. In T2DM, 1) fasting glucose (8.0±0.2 vs. 5.5±0.1, 5.5±0.1mM), peak (12.4±0.5 vs. 8.3±0.3, 8.0±0.3 mM) and net AUC (668±137 vs 145±40, 196±36 mM/5h) were higher (p<0.02) vs. lean and obese, respectively 2) fasting BCAA (495±20 vs. 339±28, 365±25µM) were higher (p<0.004) vs. both groups. 3) Peak BCAA (662±24 vs. 748±15, 571±35µM) and net AUC (29.2±5.5 vs. 55.0±9.2, 34.8±6.8mM/5h) were lower (p<0.03) only vs. lean. 5) Insulin at 30min post meal (307±65, vs. 674±56, 939±193 pM) was lower (p<0.02) vs. both groups, and total AUC (121±17 vs. 74±10, 131±24 µM/5h) higher (p=0.05) only vs. lean. Fasting and peak insulin were not different from other groups.

Thus, altered substrate responses to mixed meals in poorly controlled T2DM might contribute to their reduced 24h fed-fasted net protein balance. Their insulin resistance of glucose metabolism cannot be explained by high postprandial BCAA, as postulated by others.

No conflict of interest

O-0389

Pathway selective insulin resistance: a potential link between obesity, inflammation and hypertriglyceridaemia in type 2 diabetes

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Background: Hypertriglyceridaemia, in the face of low HDL-cholesterol, hyperinsulinaemia and chronic low-grade inflammation is considered a pro-atherogenic cocktail for patients with Type 2 diabetes. Insulin resistance has been implicated in the pathogenesis of hypertriglyceridaemia, although the precise mechanisms by which insulin resistance in various organs causes hypertriglyceridaemia remain unclear.

We previously reported that hyperinsulinaemia increases the expression of the proinflammatory cytokine interleukin-6 from insulin-resistant rat muscle, but not insulin sensitive muscle. Proinflammatory cytokines increase plasma triglycerides, by increasing hepatic triglyceride secretion and reducing peripheral triglyceride clearance. Therefore our current hypothesis is that hyperinsulinaemia raises the production of proinflammatory cytokines in insulin resistant tissues, and leads to mildly elevated plasma levels of cytokines, which cause hypertriglyceridaemia.

Methods: Transgenic rats over-expressing the gluconeogenic enzyme phosphoenolpyruvate carboxykinase (PEPCK) were studied as a model of obesity-induced insulin resistance. Lean PVGc rats served as controls. Fasting plasma triglycerides, glucose, whole body glucose turnover and insulin sensitivity were assessed in 4 and 24 week-old rats under baseline conditions and during the hyperinsulinaemic/euglycaemic clamp. White quadriceps were obtained for assessment of the IL-6, TNF-a and IL-1ß mRNA via Real Time PCR. Insulin signalling through PI-3kinase and MAPKinase were assessed via western blotting. Hepatic triglyceride secretion rate was estimated following intravenous administration of Triton-WR 1339, a non-ionic detergent that prevents triglyceride-rich lipoprotein clearance. Twenty four week-old rats underwent a hypertriglyceridaemic clamp to estimate triglyceride clearance rate.

Results: Compared to controls, 4 week-old PEPCK rats have mildly elevated plasma triglycerides (0.5±0.1 v 1.0±0.1 mM) which is associated with increased IL-6 mRNA in muscle (p<0.05 vs control). At 24 weeks of age, PEPCK rats exhibit fasting hyperinsulinaemia, mildly elevated glucose and hypertriglyceridaemia (0.5±0.2 v 1.8±0.3 mM, p<0.05 vs control). Hyperinsulinaemia in PEPCK rats is associated with increased muscle IL-6,TNF-a and IL-1ß mRNA and impaired insulin signalling through PI-3 Kinase, but not MAPKinase (p<0.05 vs control). Hypertriglyceridaemia in old rats is associated with a 60% increase in hepatic triglyceride secretion rate and a 20% reduction in triglyceride clearance(p<0.05 vs control).

Conclusion: The current study provides further evidence that hyperinsulinaemia induces proinflammatory cytokine production in insulin resistant tissue, supporting the hypothesis that hyperinsulinaemia-induced proinflammatory cytokine production is a possible cause of hypertriglyceridaemia in Type 2 Diabetes.

No conflict of interest

O-0390

Induction of Insulin Resistance (IR) by a sucrose-rich diet in rats is accompanied by increased corticosterone secretion and lipid infiltration of the adrenal cortex

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Hyperactivation of the hypothalamic-pituitary-adrenal axis has been described in humans and in animals with insulin resistance (IR). However, biochemical and cellular abnormalities associated to IR (e.g. elevated plasma glucose [GLU], serum insulin [INS], free fatty acids [FA] and triglyceride [TG] levels, changes in nitric oxide synthase [NOS] activity, oxidative stress) could directly affect adrenal steroid synthesis and release.

Aims: We studied the effects of the development of IR in adult male Wistar rats fed a sucrose-enriched diet (SED, 30% w/v of sucrose added to drinking water) for 12 weeks on serum corticosterone levels, as well as on histological changes and NOS activity in adrenocortical cells. Furthermore, the effect of high GLU, INS and palmitate concentrations (10 mM, 50 mIU/l and 80 µM respectively) on steroid production by cultured murine adrenocortical Y1 cells was evaluated.

Results: Fasting hyperinsulinemia was observed in SED-treated rats from week 3 (1.97±0.24 vs. 0.99±0.14 ng/ml; p<0.005 vs. control animals; mean±SD) onwards. After 7 weeks of SED, rats showed higher fasting plasma GLU (130±6 vs. 74±5 mg/dl; p<0.001) and serum TG (605 ± 60 vs. 105±52 mg/dl; p<0.001) levels. SED-treated animals also showed increased body weight and fat depots. Interestingly, after 12 weeks of SED administration, their adrenal glands showed a marked lipid infiltration as demonstrated by light microscopy. Simultaneously, an impairment in the insulin signalling pathway was detected in adrenocortical homogenates: lower p-Akt levels were detected by immunoblot analysis. Adrenocortical NOS activity was increased in treated animals between weeks 3 and 9. Moreover, significantly elevated serum corticosterone levels were detected in these rats between weeks 5 and 9. Only a three-day long incubation of Y1 cells with elevated palmitate concentrations induced a clear increase in steroid (progesterone) release.

Conclusions: IR induced by a sucrose-rich diet in rats is accompanied by histological and functional changes in the adrenal cortex. In particular, IR seems to develop also in adrenocortical cells, probably related to lipid infiltration of these glands. Lipid metabolites and/or locally produced adipokines could also increase adrenal steroidogenesis. In addition, an increase in NO generation could trigger post-transcriptional modifications of proteins involved in steroid biosynthesis and its modulation, and/or adversely affect insulin sensitivity in adrenocortical cells. Other factors (hypothalamic/pituitary activation, decreased corticosterone clearance) could be also responsible for the observed hypercorticosteronemia. Elevated glucocorticoid levels could contribute to the somatic and metabolic changes observed in subjects with IR.

No conflict of interest

O-0391

Insulin signaling in human primary astrocytes

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Aims: Insulin receptors are thought to be nearly ubiquitously expressed throughout the brain. However, in our recent fMRI and MEG studies with systemic or intranasal insulin applications, modulation of neuronal activity was detected only in some very specific brain regions.

One hypothesis for this observation is a modulation of neuronal activity by other insulin-sensitive cell types. Since astrocytes represent the predominant cell type in the brain and modulate neuronal function in several ways, they are potential candidates. Astrocytes (i) store glycogen and supply neurons with lactate as energy source; (ii) take up and release neurotransmitters, and (iii)

form the blood-brain barrier together with endothelial cells and pericytes.
In this study, we (i) examined whether primary human astrocytes are insulin-responsive at the molecular level and (ii) whether glucose uptake or lactate secretion is altered by insulin.
Methods: Commercially available Normal Human Astrocytes (Lonza) were grown in the recommended media. Prior to insulin stimualtion, they were starved in media containing 0.5 % FCS for 48h. Cells were lysed and the protein content of the lysates was determined using the Bradford method. Proteins were separated by SDS-PAGE. Major players in the insulin signaling pathway were detected by Western blotting using specific antibodies. Phosphorylation levels were detected with phospho-specific antibodies and the ECL system.
Glucose uptake was determined using ^{3}H-deoxy-D-glucose and lactate levels were measured enzymatically.
Results: We detected relevant expression of key proteins of the insulin signaling cascade such as insulin receptor ß-subunit, insulin receptor substrate-1, Akt / protein kinase B and glycogen synthase kinase 3 in Normal Human Astrocytes. In addition, dose-dependent (0 - 50 nM) phosphorylation of these proteins was detected following insulin stimulation for 15 minutes.
However, neither significantly increased glucose uptake after insulin treatment for 15 minutes (0-100 nM) nor lactate secretion after insulin stimulation for 6-8 hours (0-100 nM) was present in this cell type.
Conclusion: This study demonstrated that astrocytes are insulin-sensitive at the molecular level as they displayed relevant expression of the key signaling molecules of the insulin signal cascade. In addition, detection of phosphorylation of certain signaling molecules proved the functional activity of this signaling pathway. In contrast to many other cell types, insulin does not affect glucose uptake in commercially available Normal Human Astrocytes. Another important nutritive function of astrocytes, the secretion of lactate is also unaltered by insulin in these cells. Together, we show that human astrocytes represent an insulin-responsive cell type that might be involved in insulin-mediated changes of neuronal activity.

No conflict of interest

O-0392

A paradoxical role for pyruvate dehydrogenase kinase in insulin action

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Background and aims: Substitution of long-chain omega-3 fatty acids (FA) for a small percentage of dietary saturated fat prevents the development of peripheral insulin resistance with respect to glucose uptake. Distal to this, glucose 6-phosphate can be used for glycogen formation, enter glycolysis or be oxidized by the pyruvate dehydrogenase complex (PDC). Long-term regulation of PDC due to stable increases in pyruvate dehydrogenase kinase (PDHK) activities occurs in skeletal muscle in response to high-saturated fat. Our aim was to determine whether insulin sensitizing effects of long-chain omega-3 FA on muscle glucose uptake is accompanied by reversal of the adverse PDHK isoform profile induced by saturated fat.
Materials and methods: We quantified insulin action (hyperinsulinemic-euglycemic clamps) with PDHK expression profiles (Western blotting), PDHK and PDC activities (spectroscopy) and FA profiles (gas chromatography) in slow- and fast-twitch skeletal muscles of rats maintained for 4 weeks on a high saturated fat diet (HF diet) or a saturated fat diet in which 7% of saturated FA were replaced by omega-3 FA (omega-HF diet).
Results: We demonstrated increases in skeletal muscle PDHK activity and PDHK4 protein expression in conjunction with insulin resistance in response to dietary saturated fat, despite compensatory insulin secretion for lipid-induced insulin resistance. Supplementation of HF diet with omega-3 FA attenuated effects of HF diet on muscle lipid profiles. In slow-twitch muscle, reversal of insulin resistance by omega-3 FA was accompanied by reversal of PDHK activity and partial reversal of increased PDHK4 protein expression. However, there was a failure to reverse effect of a high-fat diet on the PDHK isoform profile in fast-twitch muscle. Furthermore, despite improved insulin action and unchanged PDHK activity, PDC activity was lowered. The suppression of PDC activity was not seen in this muscle type in response to HF alone.
Conclusion: Our findings suggest that, although PDHK4 expression is sensitive to suppression by insulin, its response is less than that of glucose transport to insulin. Sustained increases in PDHK activity in fast-twitch muscle are suggested as a mechanism to force FA oxidation secondary to suppressed glucose oxidation, so as to limit cytoplasmic accumulation of insulin-desensitising lipids and resultant glucose intolerance when insulin secretion is compromised.

No conflict of interest

O-0393

Resistance to fat accumulation and increase in insulin sensitivity on high-fat diet in transgenic mice overexpressing spermidine/spermine n1-acetyltransferase

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Spermidine/spermine N^{1}-acetyltransferase (SSAT) is the key enzyme in the catabolism of polyamines. Activated polyamine catabolism in transgenic mice overexpressing SSAT leads to enhanced consumption of cellular ATP levels in white adipose tissue (WAT) with concomitant activation of 5′-AMP-activated protein kinase which induces peroxisome proliferator activated receptor (PPAR)γ co-activator 1α (PGC-1α). The overexpression of this co-activator caused severely reduced WAT mass, reduced tissue triglyceride content, enhanced energy expenditure and high insulin sensitivity in SSAT mice. In this study, we investigated whether SSAT mice are protected from obesity and insulin resistance on high-fat diet (HFD).
Five-month-old female SSAT-TG (n=12) and wild-type mice (n=12) were challenged with HFD (42% calories from fat) for 13 weeks. Fasted SSAT and wild-type mice were subjected to intraperitoneal glucose tolerance test before and after 10 weeks of HFD feeding. At end of diet, fasted mice were sacrificed and tissues were collected for quantitative RT-PCR analysis.
Weight gain during HFD was lower in SSAT mice as compared to wild-type mice. HFD-induced epididymal WAT gain (27% vs. 76%) and hepatic lipid accumulation was also minimal in SSAT mice. After HFD, wild-type mice showed increased glucose and insulin levels in response to glucose load whereas SSAT mice exhibited further improved glucose tolerance (area under the glucose curve above baseline: 140±30 vs. 230±40 mmol/l•min, $p<0.05$) and reduced insulin levels similar to the levels before starting the diet. Furthermore, skeletal muscle expression of PGC-1α(1.25±0.09 vs 1.66±0.12 fold wt, $p<0.05$), PPARγ (1.32±0.23 vs 1.99±0.16 fold wt, $p<0.01$), PPARα(1.98±0.23 vs 3.32±0.30 fold wt, $p<0.01$), lipoprotein lipase (1.55±0.15 vs 2.33±0.20 fold wt, $p<0.01$), CD36 antigen/fatty acid translocase (1.36±0.14 vs 1.84±0.11 fold wt, $p<0.01$) and uncoupling protein 3 (1.44±0.14 vs 2.30±0.11 fold wt, $p<0.001$) were significantly higher in SSAT mice on HDF than in SSAT mice on standard diet. In HFD-treated wild-type, no significant changes were observed in gene expression.
We concluded that SSAT mice are protected from HFD-induced obesity. As HFD caused a significant increase in the muscle PGC-1α expression and fat oxidation in SSAT mice, HFD most likely enhanced activated polyamine catabolism and ATP consumption in skeletal muscle of SSAT mice. Increased insulin sensitivity of SSAT mice on HFD was apparently attributable to the induction of PPARγ in skeletal muscle. Taken together, these results suggest that activated polyamine catabolism modulates energy balance and glucose metabolism in mice.

No conflict of interest

ORAL PRESENTATION

Pathogenesis and novel therapies for type 1 diabetes

O-0394

Association of the IL2RA/CD25 gene with type 1 diabetes in the Belgian Population

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Background and aims: Genome wide association studies and genome wide linkage scans have identified at least 15 independent type 1 diabetes (T1D)

susceptibility loci. But, to date only the 6p21, HLA; 11p15, INS; 2q33, CTLA4; and 1p13, PTPN22 loci have been evaluated in the Belgian Diabetes Registry (BDR) for risk prediction and prevention. Therefore, the aim of the study was to evaluate the fifth susceptibility locus: 10p15, IL2RA/CD25 in a registry-based European Caucasian population and its relationship with age at onset for T1D.
Methods: T1D patients (n = 1721) with clinical onset before age 40 and positive for at least one type of diabetes autoantibodies (IAA, ICA, GADA, IA2A) and control subjects (n = 1371) were recruited via the BDR. IL2RA/CD25 was analysed by genotyping the IL2RA SNP ss52580101(C>A) using Custom TaqMan® SNP genotyping assay. Statistical methods include: chi square test, OR for relative risks (RR), PcPPV (Prevalence corrected Positive Predictive Value) for absolute risk (AR) and PS software for power and sample size calculations. The power of the study is 95%. $P < 0.05$ is considered statistically significant after Bonferroni correction.
Results: The C allele (91.2%) is more frequent compared to the A allele (8.8%), while the CC genotype (83.7%) is more frequent compared to the AC (15.1%) and AA (1.2%) genotypes. The C allele is associated with susceptibility to T1D (94.5% of patients vs. 91.2% of control subjects, RR = 1.67, AR = 0.41%, $p < 10^{-6}$), while the A allele is associated with protection (5.5% of patients vs. 8.8% of control subjects, RR = 0.60, AR = 0.25%, $p < 10^{-6}$). Similarly, the CC genotype is associated with susceptibility to T1D (89.2% of patients vs. 83.7% of control subjects, RR = 1.62, AR = 0.43%, $p < 10^{-5}$), while the AC (10.6% of patients vs 15.1% of control subjects, RR = 0.67, AR = 0.28%, $p < 10^{-3}$) and the AA (0.2% of patients vs. 1.2% of control subjects, RR = 0.14, AR = 0.03%, $p < 10^{-3}$) genotypes confer protection. The C allele (95.5% in 0-14 yrs vs. 93.5% in 15-39 yrs, p = 0.01) and the CC genotype (91.3% in 0-14 yrs vs. 87.2 % in 15-39 yrs, p = 0.008) were preferentially associated with childhood-onset diabetes (0-14 yrs), while the A allele (4.5% in 0-14 yrs vs. 6.5% in 15-39 yrs, p = 0.01) and the AC genotype (8.5% in 0-14 yrs vs. 12.7% in 15-39 yrs, p = 0.006) were preferentially associated with adult-onset diabetes (15-39 yrs).
Discussion/conclusion: IL2RA/CD25 is associated with T1D in the Belgian population. The C allele and the CC genotype confer susceptibility while the A allele and the AA and AC genotypes confer protection. In addition, the IL2RA/CD25 is associated with age at onset for T1D, suggesting that IL2RA/CD25 could be a marker for progression but confirmation requires further genotype-phenotype correlation analysis.

No conflict of interest

O-0395

Islet remodeling during diabetogenesis in NOD mice

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Autoimmune diabetes culminates when the majority of islet ß-cells have been selectively destroyed by infiltrating T-cells. Non-ß islet endocrine cells are spared this autoimmune destruction resulting in an islet remodeling that includes an apparent increase in the number of non-ß cells in the islet center. To determine how this islet remodeling occurs, we assessed islet morphology during the development of autoimmune diabetes in NOD mice. Pancreata were excised from 4-20 wk old NOD mice and age-matched Balb/c controls and immunostained for islet hormones and the leukocyte marker CD45. a-, ß- and d-cells were quantified in 4 (non-diabetic), 12 (pre-diabetic) and 20 (diabetic) wk old mice both as a proportion of total islet area and as endocrine cell mass. To address the importance of insulitis, hyperglycemia and hypoinsulinemia in islet remodeling, Balb/c mice were rendered diabetic by administration of a single dose of streptozotozin (STZ) and insulin was replaced by islet transplantation or implantable pump. The proportion of total islet area comprised of ß-cells in NOD mice decreased from 63.5±1.4% in 4 wk old mice, to 46.6±2.1% in 12 wk old mice and down to 4.0±1.1% in 20 week old mice ($p<0.001$), corresponding to a relative change in total pancreatic ß-cell mass in the 4, 12, and 20 wk old mice of 0.79±0.15, 1.3±0.23 and 0.002±0.001 mg. This decrease was accompanied by a marked increase in CD45-positive islet-infiltrating cells in 12 wk old mice that peaked in 20 wk old mice. In contrast, the percent of islet area comprised of a- and d-cells increased from 16.4±1.1% and 6.2±1.1% respectively in 4 wk old mice to 33.0±1.6% ($p<0.001$) and 23.2±1.1% ($p<0.001$) in 20 wk old mice. Surprisingly, only slight changes in a- and d-cell mass were observed during NOD mouse diabetogenesis suggesting that a- and d-cell mass are not significantly altered during progression of diabetes. BrdU immunostaining revealed a high proportion of proliferating insulin-positive cells that did not change with aging in NOD mice (4 wk: 2.6±0.1%; 12 wk: 2.7±0.3%; 20 wk: 3.3±0.5%). In contrast, the proportion of proliferating glucagon cells decreased with age from 2.9±0.2% in 4 wk old NOD mice to 1.7±0.2% and 0.9±0.2% in 12 and 20 wk old mice ($p<0.001$), respectively. Proliferation of both a- and ß-cells in Balb/c mice decreased with age although the proportion of islet cells undergoing proliferation was higher in NOD mice. In STZ-diabetic mice exhibiting no insulitis, islet remodeling of non-ß islet cells occurred regardless of whether insulin was replaced or not. Therefore, reorganization of a-, d- and PP-cells following loss of ß-cells in STZ-diabetic mice does not appear to be driven by insulitis, hyperglycemia or hypoinsulinemia. We propose that non-ß islet endocrine cells redistribute to fill the void left by loss of ß-cells within the diabetic islet once insulitis dissipates.

No conflict of interest

O-0396

Effects of exendin-4 on NOD and streptozotocin-diabetic C57BL/6 mice

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Aims: Recent studies showed most type 1 diabetic patients still preserve their residual ß-cells. On the other hand, glucagon-like peptide-1 (GLP-1) can expand ß-cell mass by stimulating ß-cell proliferation and inhibiting ß-cell apoptosis. Therefore, we hypothesized that treatment with Exendin-4, a GLP-1 analogue, might preserve ß-cell mass or even stimulate ß-cell regeneration to maintain or restore normoglycemia in NOD and streptozotocin (STZ)-diabetic mice.
Methods: NOD and C57BL/6 mice were used. The onset of diabetes in NOD mice was recognized by nonfasting or intraperitoneal (ip) glucose-stimulated blood glucose >=200 mg/dl. C57BL/6 mice, aged 8-12 weeks, were made diabetic by STZ 200 mg/kg single ip injection or 50 mg/kg/day ip injection for 5 days. Hyperglycemia was defined as nonfasting blood glucose >=200 mg/dl. Diabetic mice were treated with or without Exendin-4, 3 µg/kg bid subcutaneously, for various time periods. Intraperitoneal glucose tolerance test was performed every 2 weeks with a 5% glucose solution (1.5 g/kg). At the end of study, the pancreases were removed for insulin content measured by radioimmunoassay as well as immunohistochemistry with insulin staining to count ß-cell number.
Results: In 6 spontaneously diabetic NOD mice, 6-week Exendin-4 treatment improved glycemia in 2 mice with baseline nonfasting blood glucose >=200 mg/dl and maintained glycemia in the other 2 mice with baseline ip glucose-stimulated blood glucose >=200 mg/dl during a follow-up period up to 50 weeks. These 4 mice maintained their body weights. In diabetic NOD/scid mice induced by adoptive transfer, 6-week Exendin-4 treatment starting at the onset of hyperglycemia did not improve their blood glucose. However, 6-week Exendin-4 treatment starting from the day of adoptive transfer, 2 out of 6 mice remained euglycemic at day 49. In contrast, 5 out of 5 control mice became diabetic by day 49. For diabetic C57BL/6 mice induced by STZ 200 mg/kg single ip injection, 5-week Exendin-4 treatment starting from 1-week prior to STZ injection did not improve their blood glucose, glucose tolerance, pancreatic insulin content and ß-cell number. Treated mice had lower body weights than controls. For diabetic C57BL/6 mice induced by STZ 50 mg/kg/day ip injection for 5 days, Exendin-4 treatment, starting from 1-week before STZ injection or starting at the onset of hyperglycemia after STZ injection until 4 weeks after first STZ injection, did not improve their blood glucose, glucose tolerance or pancreatic insulin content. The former group also had lower body weights than controls.
Conclusion: Our results indicate that Exendin-4 treatment may delay the onset of diabetes in NOD mice and improve glycemia in newly-onset diabetic NOD mice, but has no beneficial effect on STZ-diabetic C57BL/6 mice.

No conflict of interest

O-0397

Otelixizumab – dose regimen optimization of a chimeric/ humanized aglycosylated anti-CD3 monoclonal antibody (MAb) in adult subjects with type 1 diabetes mellitus (T1DM)

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Aims: Otelixizumab, an Fc-disabled IgG1 MAb directed against the T cell antigen CD3e, is being developed for the treatment of autoimmune diseases, including T1DM. Phase 1b/2 open-label dose-escalation studies were conducted to identify a dosing regimen that markedly reduced pro-inflammatory cytokine release (PIC), immunogenicity, and perturbation of viral immunity, yet preserved clinical activity and targeted pharmacodynamic (PD) parameters. A prior Phase 2 study and studies in the NOD mouse model guided dose optimization.
Methods: Eleven different dosing regimens with total doses ranging from 0.3 mg to 6.85 mg otelixizumab were assessed. Over 100 T1DM adults were enrolled in 3-, 4-, or 8-day dosing regimens. Serum concentrations of cytokines, otelixizumab, and anti-otelixizumab antibodies were measured along with standard safety parameters. Viral load (EBV, CMV, HSV, VZV) and viral serology (EBV, CMV, Hepatitis B and C, VZV) were measured before and after otelixizumab administration. PD parameters were monitored using flow cytometry. Stimulated C-peptide levels were measured at baseline and up to 12 months after otelixizumab administration.
Results: A cumulative dose of 3.1 mg otelixizumab administered over 8 days was identified for use in a Phase 3 clinical trial in new-onset T1DM adult subjects (DEFEND-1). This regimen utilizes increasing doses on the first 3 days, followed by 5 higher doses that do not evoke significant PIC release. This regimen resulted in no lymphocyte depletion or other cytopenias, no electrolyte abnormalities, no clinically significant changes in liver function tests, no rashes or unexpected AEs, no SAEs, no immunogenicity and no perturbation of viral immunity. Down modulation and saturation of the CD3/TCR complex occurred after dosing, mirroring results from efficacious regimens in the NOD model. In the peripheral blood of T1DM adult subjects, increases in CD4+CD25+FOXP3+ T regulatory cells were observed. Lastly, preliminary results show that in T1DM adult subjects who were enrolled in Phase 1b/2 studies within 2 years of diagnosis and were less than 35 years-of-age, stimulated C-peptide levels for 1 year post dosing remained similar to the levels found at study entry, suggesting preservation of residual beta cell function.
Conclusion:. An optimized 8-day otelixizumab dosing regimen was identified that resulted in targeted PD changes, had no significant safety issues, and was well tolerated. The reduced pro-inflammatory profile observed after dosing may potentially contribute to efficacy via 2 mechanisms, as pro-inflammatory cytokine release is associated with negative effects on islet cell and T regulatory cells. These data provided the rationale for evaluation of this dosing regimen in an ongoing Phase 3 clinical trial (DEFEND-1).

Conflict of interest:
Employee: M. Rosenzweig, D. Mehta, D. Forman, C. McKee, L. Vaickus, employees of Tolerx

O-0398

Reg2 attenuates streptozotocin- and cytokine-induced apoptosis in Min6 cells by abrogating pro-apoptotic changes in the mitochondria

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Reg proteins constitute a conserved family of proteins in human and rodents. We have previously reported that Reg2 is expressed predominantly in islet b-cells and in pancreas-specific IGF-I deficient mice, the enhanced expression of Reg2 in b-cells correlates with protection against streptozotocin (Stz)-induced cell damage and delays the onset of diabetes. We hypothesized that Reg2 may protect b-cells from apoptosis and examined the protective effect of ectopically introduced Reg2 in Min6 insulin-producing mouse islet cell line against Stz- and cytokine- induced apoptosis. Enforced expression of Reg2 in stably transfected cells was confirmed by real time PCR analysis. Cells were incubated with 10 mM Stz or a cytokine cocktail (containing 200 pg/ml mouse IL-1b and 100 pg/ml mouse TNF-a) for 24 h following which they were labeled with Annexin-V-FITC and propidium iodide and subjected to dual label FACS analysis in order to detect and quantitate cells undergoing apoptosis. A significant increase in apoptotic cells was observed in empty vector transfected (Min6-vec) cells treated with Stz as well as cytokines (14.2 ± 2.8% and 32 ± 4%respectively) compared to untreated cells (3.2 ± 0.8%). By contrast, in Reg2 expressing cells (Min6-Reg2) the percentage of cells undergoing apoptosis induced by Stz and cytokines was significantly lower (5±1% and 15 ±2% respectively). A marked increase in the number of Min6-vec cells displaying a reduction in mitochondrial membrane potential (Dym) was seen following treatment with Stz (28.9 ± 3.3%) and cytokines (69.3 ± 6.2%), values that were significantly higher than that seen in Min6-Reg2 cells (14.5 ± 2%and 33.3 ± 6% respectively). Finally, Reg2 abrogated Stz- and cytokine-induced activation of caspases 9 and 3. We conclude that Reg2 prolongs the survival of insulin producing Min6 cells by attenuating pro-apoptotic events originating at the mitochondria.

No conflict of interest

O-0399

Vitamin D3 upregulates expression of Islet Neogenesis Associated Protein (INGAP): a potential treatment for diabetes?

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Diabetes is characterized by a complete (type 1) or partial (type 2) loss of pancreatic beta cells. Regeneration of beta-cell mass is an important goal of diabetes research. Development of strategies to induce beta-cell regeneration ***in situ*** involves identification of candidate molecules with islet regenerating activity. Islet Neogenesis Associated Protein (INGAP), identified in our laboratory, has been shown to stimulate neo-islet formation. INGAP, an endogenous pancreatic protein, is a member of the Reg3 family of proteins. We have previously shown that INGAP expression is regulated by inflammatory cytokines, more specifically by interleukin (IL)-6. It would be of interest to identify other factors, preferably of non-inflammatory nature, that upregulate INGAP expression and subsequently induce islet neogenesis. Here, using an ***in vitro*** hamster cell model and real time qRT-PCR, we show that INGAP gene expression is induced by $1,25(OH)_2D_3$, the hormonally active form of vitamin D. Our data indicate that $1,25(OH)_2D_3$ upregulates INGAP mRNA (up to 3-fold) in a dose- and time-dependent manner. We also show that nicotinamide, the amide derivative of vitamin B3, potentiates the effect of $1,25(OH)_2D_3$ resulting in a 12-fold increase in INGAP mRNA. A computer analysis of the INGAP promoter region identified three candidate vitamin D responsive elements (VDREs), which bind the ligand-activated nuclear vitamin D receptor (VDR). The role of this classic mechanism of vitamin D signaling in the upregulation of INGAP expression, as well as a potential involvement of rapid, membrane-linked signal transduction pathways remain to be elucidated.
This is the first study to provide evidence for regulation of INGAP, and possibly, of other Reg proteins by vitamin D. Interestingly, $1,25(OH)_2D_3$ can be partially activated in beta cells and is implicated in cell growth and differentiation. Given the presence of VDRs in endocrine and exocrine pancreatic tissue, the potential role of vitamin D in islet neogenesis should be further investigated. Taken together, these data suggest an important role for vitamin D in beta-cell regeneration, which may prove to be a cost-effect, natural and safe treatment for type-1 and type-2 diabetes.

No conflict of interest

O-0400

Selective resistance of mouse islets versus immune cells to indoleamine 2, 3 dioxygenase induced tryptophan deprivation stress response

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Aim: Indoleamine 2, 3 dioxygenase (IDO) is a cytosolic enzyme that catalyses tryptophan, the least available essential amino acid in the human body. IDO has a profound immunoregulatory activity on T-cells probably due to providing a tryptophan-deficient microenvironment and/or accumulation of toxic metabolites of tryptophan. Tryptophan deprivation can initiate the amino acid deprivation integrated stress response pathway in T-cells which will induce cell apoptosis in turn. As local expression of IDO in bystander fibroblasts suppresses islet allogeneic immune response, IDO can function as a local imunosuppressive factor in islet transplantation. However, it is essential to confirm that IDO

induced tryptophan deprivation does not compromise islet viability and functionality. As such, the aim of the present study was to investigate the impact of IDO on viability and function of mouse islets embedded within IDO-expressing fibroblast-populated collagen scaffold.
Methods: Mouse islets were embedded within collagen matrix populated with IDO adenovector-transduced or control fibroblasts. Islet viability, insulin content, glucose responsiveness, and activation of general control nonderepressible-2 kinase (GCN2) stress-responsive pathway were then measured in IDO-exposed islets. In vivo viability of composite islet grafts was also tested in a syngeneic diabetic animal model.
Results: No reduction in islet cells viability was detected in both IDO-expressing (96.8%±5.3) and control (94.2%±7.1) composites compared to the baseline rates. Islet functional studies showed normal insulin content and secretion in both preparations (stimulation indices of 5.3±0.5 and 5.7±0.4, respectively). In contrast to lymphocytes, GCN2 pathway was not activated in islets cocultured with IDO-expressing fibroblasts suggesting T-cell selective suppressive activity of IDO. When transplanted to diabetic mice, syngeneic IDO-expressing composite islet grafts were functional up to 100 days tested.
Conclusion: This study collectively confirms normal viability and functionality of islets in a low tryptophan microenvironment generated by IDO-expressing cells and indicates the feasibility of development of a non-rejectable IDO-expressing composite islet graft.

No conflict of interest

ORAL PRESENTATION

HEALTHCARE AND EPIDEMIOLOGY

Cohort populations and use of databases

O-0401

Data mining technology for predicting glycaemic control in new patients with type 2 diabetes

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Aims: Data mining technology is the process of extracting hidden patterns from large amounts of data, and a number of algorithms are developed. It is widely used in marketing, surveillance, and scientific discovery. However, its usefulness in the field of medicine has not been established. In this study, we compared data mining methods with conventional multivariate analyses in order to predict glycemic control in new patients with type 2 diabetes.
Methods: The study was conducted on 788 Japanese patients with type 2 diabetes, who newly visited our hospital with HbA1c levels above 6.5%. The baseline clinical characteristics (explanatory variables) and HbA1c levels after 6 months (response variables) were extracted from the hospital's electronic medical record system. Data mining algorithms (decision-tree, neural network, etc.) were compared with conventional multivariate analyses (logistic regression analysis, multiple regression analysis) for the prediction of glycemic control after 6 months.
Results: It was observed that the HbA1c levels improved from 9.0±1.9% to 7.3±1.4% during the 6 months, and 38.2% of the patients attained good glycemic control (HbA1c <6.5%) after 6 months. The duration of diabetes, mode of therapy, body mass index (BMI), total-cholesterol, HDL-cholesterol, uric acid, and creatinine were identified as common significant factors in all the analyses. For the prediction of HbA1c, the correlation coefficient between the estimated and real values was best in the neural network algorithm (r=0.536) and was superior to that in the multiple regression analysis (r=0.424). Furthermore, for the classification of good (HbA1c <6.5%) and poor (HbA1c =6.5%) glycemic control, accuracy was best in the decision-tree (C5.1) algorithm (79.8%) and was superior to that in the logistic regression analysis (72.5%).
Conclusion: Strictly speaking, the application of conventional multivariate analyses is appropriate only when the explanatory and response variables are connected with a linear combination. However, this is not true in the case of complicated diseases such as diabetes. In fact, this is why data mining algorithms were superior to conventional multivariate analyses in the present study. Diabetes is a pandemic disease, and a large amount of clinical information was collected in the database with the advancement of the electronic medical record system. Soon, data mining technology will become a powerful tool in producing useful information for evidence-based medicine (EBM).

No conflict of interest

O-0402

A novel standard to support information delivery for the fulfilment of IDF policy in Europe: results of the EU DG SANCO funded BIRO project

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Aim: The Report on the Status of Health in the European Union confirms that information on diabetes is heterogeneous, fragmented and still relatively unreliable across the EU. The increasing prevalence of diabetes calls for new forms of collaboration that would ensure timely and broad data collection. Aim of the project is to build a European information system for diabetes through the structured use, the improvement and the permanent connection of regional diabetes registers addressed by the public health project "Best Information through Regional Outcomes" (BIRO) started in December 2005.
Methods: In 40 months, representatives from seven European countries (Austria, Cyprus, Italy, Malta, Norway, Romania and Scotland) completed the following tasks: clinical review, definition of a diabetes data dictionary, privacy impact assessment, and development of fully operational software featuring the following components: database and statistical engines, communication software, and a dedicated web portal.
Results: Clinical review allowed the definition of N=54 target evidence-based parameters/indicators to be directly estimated from diabetes registers. The required common dataset included N=45 patient items and N=22 clinical site descriptors. An XML data dictionary has been designed to include all definitions and coding. A BIRO export has been defined to load standardized data in a Postgres database. The report template includes as sections: demographic characteristics, clinical characteristics, health system, population, and risk adjusted indicators. Privacy impact assessment has been carried out to identify the best architecture for the BIRO information system. Two-level R statistical routines have been developed to produce a standardized report for each local register, and to deploy a set of de-identified aggregate tables that are sent to a central server. Cumulative data is loaded in a central Postgres database and further processed to deliver the global report through a central engine. Results are uploaded to a EU web portal repository every 6 months. BIRO software is released under the GPL license.
Conclusion: The BIRO project sets new standards for public health information systems through an innovative architecture for data exchange and automated delivery of standardized diabetes indicators. Its sequel "EUBIROD", started in september 2008 and co-funded by DG-SANCO, will apply the system in 20 countries. Complete reports are available at www.biro-project.eu.

No conflict of interest

O-0403

Risk factor profile and lifestyle habits of people with impaired glucose tolerance in European populations 45-74 years-of-age within the framework of the DE-PLAN study

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Aims: To assess the risk factor profile and lifestyle habits of people with impaired glucose tolerance in the European population and to investigate which component of the FINDRISC questionnaire predicts best IGT.
Methods: Within the DE-PLAN (Diabetes in Europe - Prevention using Lifestyle, Physical Activity and Nutritional intervention). The FINDRISC questionnaire was distributed using opportunistic sampling techniques in 17 European countries during 2006-2008. In addition to the FINDRISC questionnaire, serum lipids, fasting and 2-hour glucose levels as well as systolic and diastolic blood

pressure were measured in all study participants. The risk of IGT was calculated using logistic regression analysis. The odds ratios (OR) and the respective 95% confidence intervals (CI) are presented.

Results: The final sample size consisted of 12 692 men (46%) and 14 938 women (54%) with both a mean age of 59 years. Mean body mass index (BMI) was 28.5 kg/m2 in men and 29.8 kg/m2 in women, respectively. Mean waist circumference was 101 cm in men and 95 cm in women. Men with less than 30 min daily physical activity had a 23% increased risk of IGT (95% CI 2-49%). The respective odds ratio (OR) for women was 1.25 (95% CI 1.06-1.48). Overweight (OR 1.40 (men) and 1.33 (women)) and obesity (OR 1.93 (men) and 2.13 (women)) were significant predictors of IGT before additional adjustment for central obesity. After additional adjustment for central obesity, the OR became non-significant in both gender. However, central obesity increased the risk of IGT in men (OR 1.46; 95% CI: 1.14-1.88) and women (OR 1.76; 95% CI: 1.40-2.22) even after adjustment for BMI.

Conclusions: Physical activity and central obesity seem to be independent predictors of IGT in both men and women in European population. Waist circumference may be the better predictor for IGT than BMI.

No conflict of interest

O-0404

Disparities in carotid revascularisation procedures exceed disparities in cerebrovascular disease burden among people with diabetes of South Asian and Chinese origin

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Aims: Diabetes prevalence is known to vary between ethnic groups. However, variations in macrovascular complication rates between ethnic groups have been less well established, as have utilisation rates for medical services to treat these complications. The aim of this study was to compare the rates of diabetes macrovascular complications and procedures to treat these complications between people of South Asian and Chinese origin versus the general Canadian population (mostly of European origin).

Methods: The study used administrative data sources that provided detailed information on the health care utilisation of all residents of the province of Ontario (population=12 million). Ontario is one of Canada's most ethnically diverse provinces, with 6.6% of the population reporting South Asian origin and 4.8% reporting Chinese origin. The entire population with prevalent diabetes as of 1 July 2006 in Ontario was identified from an administrative data-derived disease registry. South Asian and Chinese ethnicity was assigned based on surname, using lists of surnames specific for each ethnic group that have been validated against self-reported ethnicity. All other people were assigned to the general population group. The rates of hospitalisation for myocardial infarction and stroke, and of coronary and carotid revascularisation procedures were measured for the following one year. Baseline differences between groups in age, sex, socioeconomic status and diabetes duration were adjusted for using logistic regression.

Results: The crude prevalence of diabetes was 12.9% among people of South Asian origin, 7.2% among people of Chinese origin, and 9.1% in the general population. Compared to the general population, hospitalisations for myocardial infarction were similar for people of South Asian origin (OR 0.99, 95% CI 0.88-1.12, p=0.9) but less common for people of Chinese origin (OR 0.37, 95% CI 0.31-0.45, p<0.001). Coronary revascularisation procedures followed these trends (OR 1.09, 95% CI 0.98-1.21, p=0.1 for South Asian; 0.39, 95% CI 0.32-0.47, p<0.001 for Chinese). Stroke hospitalisations were less common in both ethnic groups (OR 0.79, 95% CI 0.65-0.96, p=0.02 for South Asian; 0.73, 95% CI 0.60-0.88, p=0.001 for Chinese), but carotid revascularisation procedures were much less common (0.26, 95% CI 0.10-0.70, p=0.007 for South Asian; 0.32, 95% CI 0.13-0.78, p=0.01 for Chinese).

Conclusion: Compared to the general diabetic population, people of South Asian origin had fewer strokes, while people of Chinese origin had fewer myocardial infarctions and strokes. However, the difference in carotid revascularisation procedures was even greater than the difference in disease burden. These findings suggest a disparity in access to carotid revascularisation and/or a difference in distribution of cerebrovascular disease for diabetic patients of South Asian and Chinese origin.

No conflict of interest

O-0405

A prospective study of risk of self-reported diabetes in U.S. military participants of the Millennium Cohort Study in relation to combat deployment and mental health

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Aims: Little prospective data exist on the risk of diabetes in persons serving in the military. We examined potential risk factors for self-reported diabetes mellitus over a 3-year follow-up period that included the initiation of military conflicts in Afghanistan and Iraq in members of the Millennium Cohort Study who did not self-report diabetes at baseline.

Methods: Study subjects included a random sample of all active duty, Reserve, and National Guard U.S. military on Oct 1 2000. Of the 77,047 subjects who completed a baseline self-administered paper or online survey in 2001, 53,844 also completed a follow-up survey in 2004 and did not report diabetes at baseline. The survey instruments elicited information on demographics, height, weight, lifestyle, military service, clinician-diagnosed diabetes, and other physical and mental health conditions. Presence of post-traumatic stress disorder (PTSD), panic disorder, and depression symptoms were assessed using the Patient Check List and the Patient Health Questionnaire. Deployment information since Sept 2001 was obtained from electronic U.S. Department of Defense databases, while combat exposure was assessed by self-report at follow-up. Odds of newly self-reported diabetes mellitus in relation to exposures of interest were estimated using logistic regression analysis. Exposures were assessed at baseline except for deployment and combat exposure that mainly occurred after baseline.

Results: Occurrence of self-reported diabetes mellitus during follow-up was 3/1000 person-years. Persons reporting diabetes at follow-up compared to those who did not at baseline were significantly older (41 yrs versus 36 yrs, p<0.001), had greater BMI (29 kg/m^2 versus 26 kg/m^2, p<0.001), were less likely to be of Caucasian race (64% versus 72%, p<0.001), but were similar by gender. Relative odds of self-reported diabetes mellitus (95% confidence interval) for mental health conditions in 3 separate models adjusted for age, gender, educational level, BMI, and ethnicity were as follows: depression 1.4 (0.9 - 2.3), panic disorder 2.7 (1.5 - 4.8), and PTSD 2.1 (1.4 – 3.0). Deployments since Sept 1 2001 were not significantly related to self-reported diabetes mellitus risk with [1.0 (0.7 – 1.4)] or without [0.7 (0.5 – 1.1)] combat exposure adjusted for age, gender, educational level, BMI, and ethnicity.

Conclusions: In this relatively young U.S. military cohort, a history of panic disorder and PTSD symptoms at baseline were significantly associated with future risk of self-reported diabetes mellitus. Military deployment or symptoms of depression were not found to be significantly associated with this outcome. To our knowledge these are the first data from a prospective study that support an association between PTSD symptoms and the development of diabetes.

No conflict of interest

O-0406

Metabolic syndrome in patients with bipolar disorders and the general population of Spain: findings from a population-based case-control study, BIMET-VIVA study

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Aims: To compare the frequency of Metabolic Syndrome (MS) and its components between patients with Bipolar Disorder (BD) under psychiatric pharmacological treatment with the general population in Spain.
Methods: The BIMET study enrolled 532 (321 females-60.3%), patients (mean age 46.3±13 years), according to DSM-IV TR criteria, from Spanish mental health centres. The VIVA Study is a multicentre (9 sites), population-based, epidemiological study. Both studies were performed between 2007-2008. A random sample of 1560 individuals (three controls per case), matched by age (mean age 47.6±9.4 years) and sex, were selected from the VIVA data set (n=2828). Fasting blood glucose (FBG), HDL-cholesterol, triglycerides, BMI, waist circumference and blood pressure were measured in both study groups. The National Cholesterol Educational Program NCEP/ATP III and the International Diabetes Federation (IDF) definitions were used for MS.
Results: Overall, the prevalence of MS-NCEP was 25.1% (95%CI 21.1-29.5) in BD patients and 19.3% (95%CI 17.4-21.4) in controls (p<0.05). Corresponding figures for IDF were 34.8% (95%CI 30.1-39.6) vs. 29.8% (95%CI 27.5-32.1) (p<0.05). Gender-related differences between BD patients and controls were only observed in males (28.5% vs 16.8% for NCEP and 40.2% vs. 26.4% for IDF) (all p values <0.001). Among BD patients, males showed a higher frequency of MS than females (28.5% vs. 23.0% by the NCEP criterium and 40.2% vs. 30.9% by the IDF). There was a higher prevalence of IDF-abdominal obesity in the Spanish female population (78.7% in BD and 66.2% in controls) compared with male population (64.7% in BD and 49.8% in controls). BD patients, males or females, had also higher values than controls in BMI 28,2±5,4 vs. 27,6±4,5 (p=0.02); waist circumference: 96±17,1cm vs.88,4±11,5cm (p<0.001); triglycerides: 145,4±102,2 mg/dl vs.116,8±81,4 mg/dl (p<0.001); and systolic blood pressure in males:129±14,6 mmHg vs.125,9±19,2 mmHg (p=0.02). Logistic regression identified the waist circumference and triglycerides as the two main independent variables explaining the higher frequency of MS observed in BD patients than in controls.
Conclusion: One out of three BD patients under psychiatric pharmacologic treatment in Spain, have MS according to the IDF criteria. This is significantly higher than in the general population, where the prevalence of abdominal obesity is already very high, particularly in women. The components of the MS which better explain the observed higher prevalence of MS in BD patients than in the general population, are waist circumference and triglycerides.

No conflict of interest

O-0407

Prevalence of central obesity, raised body mass index, physical inactivity and family history of type 2 diabetes in young urban persons in Sri Lanka (DIABRISK SL stage 1): a general population study

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Background and aims: The prevalence of Type 2 diabetes (T2DM) and associated cardio-metabolic disease is rising rapidly in South Asia, especially in young adults, and is of global public health concern. The prevalence of risk factors that predispose to cardio-metabolic disease in young persons in this population is unknown. Earlier studies had identified physical inactivity (defined as less than 30 minutes continuous exercise per day for less than 3 days of the week), raised body mass index (BMI), raised waist circumference (WC) and first degree family history (FH) of T2DM as the main risk factors associated with a diagnosis of T2DM in those below 40 years of age.
Methods: To evaluate the prevalence of these risk factors we studied 22,577 (10,612 M, 11,965 F) healthy subjects aged between 6-40 years representative of the general population demographics of Colombo District in Sri Lanka. A detailed previously validated questionnaire was used to assess physical activity and family history of T2DM and measurements of weight, height and waist circumference were taken.
Results: Of the 22,577 subjects, 8814 (46%M) were between 6-14yrs, 4,703 (41%M) between 15-19yrs and 9060 (51% M) between 20-40 yrs of age. The prevalence of a raised BMI (age appropriate) between 6-14 and 15-19 yrs was 19.7% and 15.4% respectively with no significant differences between men and women. Over 20 years 28.1% of men and 21.9% of women were overweight (BMI=>23)(p <0.001 M vs. F). A prevalence of a raised WC[age and gender appropriate] was significantly greater in women for each age group: 42.9% vs. 32.0% 6-14 yrs; 28.2% vs. 16.0% 15-19 yrs; 34.4% vs. 25.9% 20-40 yrs (F vs. M p<0.05 for all). Similarly physical inactivity was significantly greater in women compared to men for each age group: 39.9% vs. 15.0%; 51.6% vs. 19.5%; 63.0 % vs. 41.1% and rose in both sexes with age (p<0.05 for F vs. M and with increasing age). A FH of T2DM was documented in 26.2% of all subjects. Only 32.6% of the population studied had no risk factors, with 33.1% displaying one risk factor and 34.2 % two or more risk factors. Two or more risk factors were noted in 32.0% of subjects aged 6-14yrs, 28.7% in 14-19 yrs and 39.3% in 20-40 yrs.
Discussion and conclusion: There is a high prevalence of early modifiable cardio-metabolic risk factors in the general population of Sri Lanka aged below 40 years. Physical inactivity and raised WC are significantly more prevalent in women across all age groups and physical inactivity rises significantly with increasing age. Intervention strategies are required to address early these risk factors.

Conflict of interest:
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ORAL PRESENTATION

EDUCATION

Addressing psychosocial issues

O-0408

Diabetes-related information and behavioral/psychological outcomes in the Diabetes Attitudes, Wishes and Needs Youth Study

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Aims: To assess the relationship of diabetes-related information with behavioral/psychosocial outcomes in youth with diabetes.
Methods: The Diabetes Attitudes, Wishes and Needs (DAWN) Youth Study conducted two cross-sectional internet surveys with independent national samples of: (1) parents of children/adolescents (age 0-18) with diabetes (N=4099) and (2) young adults (age 18-25) with diabetes (N=1905). Respondents from the US, Japan, Brazil and 5 European countries provided self-report data for diabetes-related information received at diagnosis and sources of current diabetes-related information, as well as 5 outcomes: school performance impact, burden of diabetes, psychological well-being, successful self-care and diabetes-specific coping. Multiple regression assessed significant (p<.05) independent associations of information measures with each outcome, controlling for country of residence and a variety of demographic and disease characteristics.

Results: For young adults several findings were observed. Number of information topics at diagnosis was independently associated with better outcomes for 3/5 measures (all except self-care and well-being); number of current information sources with better outcomes for 4/5 measures (all except school impact). Specific sources of current information were independently associated with different numbers of better outcomes (people with diabetes = 4/5, health care providers = 3/5, family-friends = 2/5, diabetes organizations = 2/5, diabetes education programs = 1/5, internet = 0/5). No information measure was significantly associated with any worse outcome.
Findings were similar for parent-reported outcomes. Number of information topics at diagnosis was independently associated with better outcomes for 4/5 measures (all except well-being); number of current information sources with better outcomes for 4/5 measures (all except school impact). Specific sources of current information were independently associated with different numbers of better outcomes (diabetes education programs = 3/5, diabetes organizations = 2/5, health care providers = 1/5, people with diabetes = 1/5, family-friends = 1/5, internet = 0/5). Internet information was significantly associated with worse well-being.
Discussion/conclusions: Information at diagnosis and multiple sources of ongoing information may contribute to good outcomes among youth with diabetes and their parents. Information from sources other than traditional diabetes education/care providers shows potential to have positive effects. Benefits of information extend beyond educational and health care outcomes to include a broad range of psychosocial outcomes.

Conflict of interest:
Paid lecturing: Mark Peyrot, Novo Nordisk
Advisory board: Mark Peyrot, Novo Nordisk
Employee: Soren Skovlund, Novo Nordisk
Commercially-sponsored research: Mark Peyrot, Novo Nordisk

O-0409

Sharing experiences in groups - diabetes a lifelong psychological challenge

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Living with type 1 diabetes is a lifelong psychological challenge, and many patients feel lonely and not fully understood by relatives and health professionals.
Aim: The aim of this study was to:
1. design an empowerment based support group for patients with type 1 diabetes in which they could share experiences related to life with diabetes
2. examine how the participants valued the intervention

Material and method: The criteria for participating in the support groups were: type 1 diabetes for more than two years and being older than 21 years of age. Five support groups based primarily on motivational and empowerment theory were established. Each group met 8 times for 2 hours and 15 minutes.
The outcome was evaluated both by qualitative and quantitative methods. Focus group interviews were conducted after each support group and were analysed using thematic analysis. The following questionnaires were applied when the group started and ended: PAID (Problem Areas in Diabetes), WHO-5 (Well-Being Index), SCL-90R (general psychological distress) and Sheehan Disability Scale. HbA1c were measured at the same time.
Results: 41 participants signed up for the support groups and 34 (82, 9%) of these completed 6.8 sessions on average. The 34 persons were between the age of 22 and 63 with diabetes duration of 22,8 years (±10,9) and HbA_{1C} of 7,9 % (±0,98) respectively.
The focus group interviews showed that sharing experiences among peers was appreciated most. The group process stimulated the feeling of normalcy and not 'being alone'. They felt recognized and supported participating in this kind of diabetes mini-society. They gained new insights on different perspectives of living with diabetes, which for some resulted in a change in both attitude and behaviour for instance concerning SMBG. Three of the five groups have continued to meet after the support group ended.
The study showed significant reduction of diabetes related distress measured with PAID ($p<0,001$), general psychological distress measured with Symptom Check List 90-R ($p<0,01$) and the depression subscale on SCL-90R ($p<0,05$). Well-being measured with WHO-5 also improved ($p<0,05$) right after participating in the support group. No change in social function measured by Sheehan Disability Scale or HbA1C was seen.
Conclusion: There is a need for participating in diabetes support groups regardless of HbA1C level. The format of the groups was suitable for a diabetes setting. The participants found the group valuable in order to manage psycho-social aspects of living with diabetes in a better way. Wellbeing as well as diabetes related distress improved significantly.

No conflict of interest

O-0410

Self-reported physical stress signs and risk of type 2 diabetes mellitus: a prospective cohort study

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Type 2 diabetes mellitus (T2DM) is one of the fastest growing chronic diseases in Korea and its prevalence affects over 10% of the population. The putative risk factors for T2DM, in the Korean population includes, but is not limited to, older age, urban living, female gender, higher obesity level, smoking, family history of diabetes, liver function, metabolic syndrome status, elevated blood pressure, and triglyceride level. However, chronic stresses, such as psychological, physical, and physiological responses to the onset of diabetes are unknown. Extended exposure of the cortical, from chronic stress, could result in a number of negative health outcomes, such as obesity, hypertension, and cardiovascular diseases. However, its relationship to T2DM is unknown. Thus, in this prospective study we evaluated the incidence of diabetes and stress.
This is a community based, prospective cohort study, consisting of a total of 10,038, (5,018 rural and 5,020 urban), Korean men and women in the age range of 40-69 yrs. Anthropometric parameters and social factors, as well as biochemical parameters, were measured. All participants, except those on oral hypoglycemic medications or insulin therapy, underwent two-hour, 75g oral glucose tolerance tests at baseline and then were followed up biennially. Physical stress was ranged from a minimum score of 0 to a maximum of 10, based on 10 different physical stress signs, such as difficulty in breathing, dry throat or mouth, difficulty in sleeping, headaches, asthemopia, stiff neck or shoulders, chest discomfort, nausea, loss of appetite, constant constipation or diarrhea, and chronic fatigue. For the analysis, we only included subjects who had completed 6 years of follow-up examinations and were free of T2DM at the baseline examination. Thus, a total of 6,466 people are the subjects of our current analysis. Of the 6,466 follow-up subjects, 629 developed T2DM during the 6-years of the follow-up period.
According to the ROC analysis, we identified a threshold stress level of 5 and 8 to differentiate T2DM in men and women, respectively. After adjusting for age, place of residence, waist circumference, number of pregnancy, systolic blood pressure, family history of diabetes, education levels, monthly income, living with a partner, ALT, WBC, total cholesterol, HDL, LDL, Triglyceride, ß-cell function, HOMA-IR, and HbA1c, 25 out of 156 men who reported more >5 physical stress signs developed type 2 diabetes in the risk of 1.93 folds (95% CI 1.21 – 3.09), whereas 16 of 93 women who reported >8 physical stress signs developed T2DM in the risk of 2.24 folds (95% CI 1.22– 4.1).
In conclusion, our study demonstrated that stress was associated with the onset of T2DM in a large multi faceted population. The study results suggest each sex had a different threshold level of stress predict T2DM.

No conflict of interest

O-0411

Treatment adherence, diabetes-related stress and support in their relation with disease control in adolescents with type 1 diabetes

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Aims: The study aims to test hypotheses on:
1. The effect of treatment adherence on diabetes control/severity.
2. The role of diabetes-related stress in contexts of adherence and diabetes control,
3. the differential role of tangible and social support in diabetes control.

Methods: The study included 11-19 year-old youngsters with type 1 diabetes, who are all on daily insulin injection or pump. A total of 437 adolescents

(54.8% girls; mean age 14.7 years; mean diabetes duration 6.1 years) participated in the study. Metabolic control was assessed by measuring HbA1c and adolescents filled out questionnaires during their visits in their local clinics in presence of diabetes nurse, whereas questionnaires for family members were sent and returned by mail. A model was constructed based on hypotheses drawn from a review of relevant literature, testing the relations between study variables representing the three aims. Each hypothesis was tested using Amos version 7.0. Multi group analysis was conducted on the final model to test generalizability of the model across gender and age.

Results: Structural equation modeling showed a strong effect (ß=-.40, p<.01, 16% variance explained) of treatment adherence on diabetes control (including A1c, and Hospital Admission due to Ketoacidosis, Hypoglycemia, and Hyperglycemia) with good indices of model fit X^2(df = 1) = 2.44, GFI = .99, TLI = .96, CFI = .99, and RMSEA = .057. Inclusion of diabetes-related stress in the model explained an additional 7% variance in diabetes control whereas specifying role of diabetes-related stress as a mediator between treatment adherence and diabetes control in the third model explained an overall 36% variance in diabetes control with good fit indices. In line with the hypothesis, although diabetes specific support appeared to improve treatment adherence (ß=.28, p<.01) it also added to diabetes-related stress (ß=.44, p<.01). General social support not only appeared to have a positive effect on treatment adherence (ß=.18, p<.01), it also decreased diabetes-related stress (i.e., ß=-.16, p<.01; X^2(df = 14) = 21.46, GFI = .99, CFI = .98, and RMSEA = .035). Although multi group analysis generally confirmed the fit of the model across gender and age, some regression weights were rendered nonsignificant, possibly indicating lack of statistical power given the complexity of the model.

Conclusion: Diabetes-related stress plays a critical role in the relation between adherence, social support, and diabetes control, and should be addressed by diabetologists and diabetes educators. To gain maximum from treatment adherence, need-based diabetes-specific support should be provided and adolescents shall be encouraged to engage in general (non-diabetic) activities like their normal counterparts.

No conflict of interest

O-0412

Impact of personalised cardiovascular disease (CVD) risk estimates on physical activity

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Aim: Population screening for cardiovascular disease (CVD) risk factors and estimation of risk is widely practised. To determine if the provision of personalised risk information can motivate behaviour change, we assessed the effects on physical activity levels over one month of providing a personalised 10-year CVD risk estimate to individuals at increased CVD risk.

Methods: A total of 215 individuals, aged 40 to 70 years, without known CVD but at increased CVD risk (defined as a Framingham-derived 10-year CVD risk =20%) were recruited from 4 UK general practices. 194 eligible participants were randomised in a 2x2 factorial design, to receive a personalised 10-year CVD risk estimate (n=99) or information on their blood pressure (BP), total cholesterol and fasting glucose values, and if any of these were elevated according to current guidelines (n=95). The intervention group had their 10-year CVD risk estimated using the UKPDS Risk Engine and were shown their current risk as well as their 'achievable risk'. The latter was defined as the risk estimate they would have assuming they could achieve current guideline targets for BP, LDL cholesterol, HbA1c and smoking cessation (if applicable). Participants were simultaneously randomised to receive or not receive a brief lifestyle advice intervention. We report here the personalised risk estimate arm. The primary outcome was change in physical activity measured by a hip-worn accelerometer (MTI Actigraph), with 80% power at the 5% level of significance to detect a difference of 30,000 total accelerometer counts per day between groups (approximately equivalent to 10 minutes brisk walking). Accelerometer, anthropometric and biochemical information was collected before and one month after randomisation.

Results: Participants had median (IQR) age 62.3 years (54.9, 66.1) and HbA1c 5.7 % (5.3, 6.1), 67% were male and 19% had known diabetes. At baseline, blood pressure was mean (SD) 140 (18)/ 81 (11) mmHg and LDL cholesterol 3.1 (0.9) mmol/L. Body mass index was median (IQR) 28 kg/m^2 (26, 31) and estimated 10-year CVD risk 48 % (34, 60) in men and 31 % (22, 43) in women. In the 185 (95%) participants attending follow-up, there was a non-significant 0.5% (p=0.56) greater increase in accelerometer counts in those receiving personalised CVD risk estimates. No significant within or between group differences were seen except a net 7% decrease in mean LDL cholesterol (p=0.004) in the intervention group. This was not related to an increase in new prescriptions for lipid lowering therapies (4 in the intervention group, 5 in the control group, P=0.74).

Conclusions: Provision of personalised 10-year CVD risk estimates alone did not appear to influence physical activity or estimated CVD risk in adults at increased risk of CVD.

No conflict of interest

O-0413

Depression and self-care activities in Korean patients with diabetes mellitus

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Background: Depression is known to be a risk factor for diabetes mellitus. Conversely, diabetes is also shown to be a risk factor for depression. Patients with diabetes have twice the risk of depression as the general population. Depression in patients with diabetes may cause worse clinical outcome through lower adherence to several self-care activities. Furthermore, diabetic patients with depression may be more likely to have diabetic complications. We aimed to explore the prevalence of depression and its impact on self-care activities in Korean diabetic patients.

Method: We surveyed diabetic patients using questionnaires such as Harvard Department of Psychiatry/National Depression Screening Day Scale (HANDS) and the Summary of Diabetes Self-Care Activities (SDSCA) to assess depressive symptoms and self-care activities, respectively. Patients were categorized as having major depressive disorder if HANDS score was =9.

Results: Of the 191 respondents, 39 (20%) patients had depression. Only 6 (15.3%) of them had been managed for their psychiatric problem previously. The proportion of women was significantly higher than men in patients with depression (74.3% vs. 25.7%, P<0.001). Moreover, women exhibited higher HANDS score than men (6.15 ± 5.38 vs. 3.45 ± 4.82 P<0.001). Patients with depression showed worse diet control and fewer self-glucose monitoring as compared with those without depression. However, there was no difference in exercise, foot care, smoking status, metabolic control and diabetic complications between the two groups.

Conclusions: Many diabetic patients in Korea, especially women, have depression which seems to have an adverse impact on self-care activities. Early identification and proper treatment of depression should be considered in the management of diabetes.

Table 1: Clinical characteristics of study subjects

No conflict of interest

Table 1

	Total	Unlikely major depression (HANDS score <9)	Probable major depression (HANDS score =9)	*P* value
n	191	152	39	
Age (yr)	58.9 ± 12.4	58.6 ± 11.7	60.0 ± 14.8	0.528
Female	98 (51.3%)	69 (45.3%)	29 (74.3%)	0.001
Diabetic duration (yr)	8.8 ± 7.3	8.6 ± 7.1	9.3 ± 8.3	0.613
Patients taking insulin injection (n)	65 (34.0%)	102 (67.1%)	24 (61.5%)	0.513
Patients with retinopathy (n)	70 (36.6%)	94 (61.8%)	27 (71.0%)	0.291
HbA1C (%)	7.98 ± 1.77	8.01 ± 7.87	7.87 ± 1.76	0.683
Total cholesterol (mg/dl)	174.78 ± 35.36	172.12 ± 35.69	184.65 ± 32.77	0.075
Triglyceride (mg/dl)	176.07 ± 114.93	170.97 ± 107.89	196.16 ±139.22	0.235
HDL-cholesterol (mg/dl)	59.29 ± 145.09	62.24 ± 161.76	47.28 ± 14.52	0.646
LDL-cholesterol (mg/dl)	94.51 ± 34.97	93.01 ± 36.35	100.53 ± 28.62	0.338
ACR (mg/mg)	106.43 ± 321.39	118.04 ± 351.74	56.00 ± 113.01	0.406

O-0414

Link between psychopathology and quality of life in diabetic patients

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Introduction: Psychopathological symptomatology, namely anxiety and depression, is known to be present in chronic diseases like diabetes. Quality of life (QoL) is a multidimensional aspect of each individual that combines physical, psychological, emotional and social well-being perceptions. Therefore QoL is an outcome measure which can, somewhat, reflect issues related to psychopathology.

Aims: To evaluate the psychopathological symptomatology and its contribution to QoL in type 1 (DM1) and type 2 (DM2) diabetic patients.

Patients and Methods: We gathered a sample of 94 diabetic subjects, 50% males, 55.3% type 1, with a mean age of 42.02 ± 16.68 (17-77) years. To accomplish our work we applied several instruments: a general biographical questionnaire, the Audit of Diabetes-Dependent Quality of Life (ADDQoL) and the Brief Symptom Inventory (BSI).

Results: We found significant negative correlations between ADDQoL and six sub-scales of the BSI and, above all, its general symptom index ($r = -0.27$; $p = 0.009$). In concern to differences between type of diabetes, we noticed that DM2 tend to reveal more phobic anxiety ($p = 0.04$) and somatization symptoms ($p = 0.002$) rather than DM1 patients. These results are also true when we compare gender, this is women report higher values in those two sub-scales. These two symptoms also relate themselves negatively with self-monitoring of diabetes and the level of education of the patients. The impact of psychopathological issues in QoL is greater in DM1 rather than in DM2 patients. In the whole sample, we observed that mean psychopathological values are below the normal Portuguese range for emotional disturbances.

Conclusions: In this sample it is clear the influence of psychopathological symptomatology in the QoL of diabetic subjects. These symptomatologies are more often found in patients with DM2 but its impact in QoL is greater in patients with DM1. There are some QoL aspects that are more directly linked with a particular kind of symptomatology.

No conflict of interest

WORKSHOP

ASSOCIATION DEVELOPMENT

Setting up national health programmes

0415

Workable ideas from the field on how to develop diabetes national programmes in resource restrained settings

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Setting the scene: Zambia's healthcare delivery system is still a work in progress.

With a Gross Domestic Product of US$330, a population of nearly 12 million, Zambia's road towards quality, cost-effective and affordable healthcare as close to the family as possible will be long and difficult.

Zambia's resource envelope is biased towards communicable diseases. Currently there is no National Policy for Non-communicable diseases including Diabetes Mellitus.

According to the Abuja Declaration on Health and Microeconomics, Zambia would need US$33 per capita per year to provide a basic package of care but at present the national average is only between US$6 and US$10.

Diabetes care: Diabetes Mellitus management is less than ideal. Long distances from health centres, chronic shortage of Diabetes Medicines, lack of a cold chain, lack of trained healthcare providers, poor motivation of staff, the brain drain and urban drift, lack of political will are some of the problems besetting Diabetes care in Zambia.

Local solutions: instead of abandoning People-living with Diabetes (PLD), local solutions are being used to help PLD.

The Diabetes Association of Zambia (DAZ) through its branches provide from time to time one to two days training seminars for health workers and PLD, and organise annual Youth Camps and an Insulin Bank for Children at the University Teaching Hospital.

Partners such as LifeScan, Norwegian Diabetes Federation, Ministry of Health are on board etc. Local Radio Stations and newspapers have been used to raise awareness, advocacy, education and recruit new members.

Diabetes care also innovatively piggybacks on HIV/AIDS programme by poaching Laboratory facilities. Some DAZ branches benefit from joining nutritional programmes. Diabetes medicines are transported using local buses. The use of cellular phones has also helped in part to resolve communication problems.

Outcomes: Innovation rather than National Policy has helped PLD. Diabetes awareness has improved. There is better access to decision makers. A National Policy to be put in place soon?

No conflict of interest

0416

Assessment of implementation and outcome of national diabetes programmes

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Aims: The Finnish National Diabetes Programme (DEHKO 2000-2010) was prepared by a group of 100 voluntarily working researchers, doctors, nurses and people with diabetes under coordination of the Finnish Diabetes Association in 1998-2000. In addition to the 13 clear objectives, the programme includes 25 action recommendation for achieving the objectives, and a plan for regular evaluation and assessment of the progress and results. The goal with assessment was to keep the ten-year programme running in the right direction, to make corrections, if needed, and to update the objective, especially the key actions, according to development of the situation in health care.

Methods: Following the assessment plan of the DEHKO Programme, the Finnish Diabetes Association, as coordinator of the programme, hired researchers and companies to make the following assessments: 1) The DEHKO Programme as a health programme (2000), 2) The glycemic control level of the Finnish diabetic population in 2000-2001, 3) Satisfactory of the Finnish diabetic patients in 2000, 4) The first intermediate assessment of the progress of the DEHKO Programme (2003), 5) The regular follow-up surveys on the quality of diabetes care and resources in the health centres and hospitals 2003-2009, 6) The first Diabetes in Finland Study on prevalence of diabetic complications (2005), 7) The intermediate assessment of DEHKO`s prevention of type 2 project (FIN-D2D) 2005 and 2006, 8) The intermediate assessment of the progress and preliminary results of the DEHKO Programme (2006) 9) The second Diabetes in Finland Study on the prevalence of complications (FINDM2, 2009) and 10) The cost of diabetes in Finland (CoDiF, 2009).

Results: 2 The official and scientific assessment of the programme, in addition to the regular evaluation in annual meetings and in the bigger educational days every three years, are, according to the experience of the Finnish Diabetes Association in DEHKO Programme, the keys for the overall coordination of a national diabetes programme. The regular evaluation and assessment and dissemination of their reports have given the programme credibility amongst the health care providers, decision makers and people with diabetes. In addition, leading and annual planning of this long-term programme has been easier with all the information received through the regular follow-up studies in assessment. Finally, the results of the DEHKO Programme can be measured through the outcome of the assessments.

Discussion: The national diabetes programmes should include objectives, concrete action plans, clear time frame, and at least some sort of evaluation on the action and results. Hiring outside researchers and companies to make assessment is normally quite expensive but that is the way to receive neutral view on the progress of the programme, its strengths and weaknesses. All this helps you to navigate the ship to the right direction and final end.

No conflict of interest

0417

The status of national diabetes programmes: from siloes to synergies

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In the 20 years since the St Vincent Declaration, national diabetes programmes (NDP) have become entrenched in many countries. Despite this there has been little progress in developing robust evaluation frameworks for NDP on a collective basis. This presentation will explore and analyse the changing face of NDPs over the past decade or so, and possible strategies for evaluating NDPs. In doing so it will:

a. track the evolution of NDPs from their initial narrow focus on health systems alone to their current broader focus on prevention and care of the diagnosed, and integration with related chronic diseases
b. analyse and discuss possible reasons, benefits and drawbacks of these changes
c. present the results of a global survey of IDF members organisations on the current status of NDPs which was undertaken in 2008
d. discuss ways of promoting and ensuring the quality and effectiveness of NDPs and
e. considerations for evaluating NDPs

No conflict of interest

ORAL PRESENTATION

Association-based initiatives to improve diabetes-related care

O-0418

Four-year impact of a continuous quality improvement effort implemented by the Italian Association of clinical Diabetologists (AMD)

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Aims: Direct measurement, feedback, and reporting of intermediate outcome levels or of level of medication management may enhance the effectiveness of care. We evaluated the impact of a continuous quality improvement effort implemented by a network of diabetes outpatient clinics in Italy and promoted by the Associazione Medici Diabetologi (AMD).
Methods: Overall, 122 clinics participated, of whom 87 joined the initiative since 2005 (Group A) while the remaining 35 were first involved in 2008 and served as control group (Group B). Centres providing valid data for 4 years were selected in both groups, leaving 67 centres in goup A and 18 centres in group B included in the analysis. All centres used electronic medical record systems. Process and intermediate outcomes indicators were identified and a software was developed, enabling the extraction of the information needed for the profiling of quality of care. Data were centrally analyzed anonymously and results were published annually (AMD Annals). The performance of the different centres was ranked against the "best performers". We compared quality indicators between the two groups of centres over four years (from 2004 to 2007). For each indicator, a multilevel model adjusted for gender, age, diabetes duration and clustering effect was performed.
Results: Over 100,000 patients with type 2 diabetes were evaluated every year. The table shows for the two groups of centers the annual proportion of patients with at least one value registered during the year (process measures), the percentage of patients reaching specific favorable or unfavorable targets (intermediate outcome measures), and rates of use of drugs.
Discussion/conclusions: Diabetes care profiling and benchmarking activities implemented by a large network of diabetes clinics were able to improve clinical outcomes and, to a lesser extent, process measures. Increasing rates of use of different classes of drugs were also documented. The same positive trends were not systematically found in those centres not previously involved, thus suggesting a direct, positive effect of the initiative.

Indicator	2004	2005	2006	2007	2004-2007 %variation
HbA1c monitoring A B	93.05 93.08	93.41 95.12	93.72 94.68	93.71 94.57	0.66 1.49
Blood pressure monitoring A B	87.52 91.66	85.29 92.04	87.22 90.18	86.41 90.79	-1.11 -0.87
Lipid profile monitoring A B	68.12 79.30	70.07 82.04	72.39 81.94	74.31 81.75	6.19 2.45
HbA1c <=7% A B	41.57 43.01	43.03 44.61	46.85 43.72	47.58 44.29	6.01 1.28
HbA1c >=9% A B	12.67 14.04	11.79 13.16	10.27 12.66	9.88 11.99	-2.79 -2.05
BP <=130/85 mmHg A B	32.42 31.92	33.35 30.67	36.57 32.43	38.84 30.55	6.42 -1.37
BP >=140/90 mmHg A B	64.66 65.66	63.61 65.88	59.94 64.23	57.32 64.80	-7.34 -0.86
LDL-C <100 mg/dl A B	28.97 26.70	32.94 31.46	37.33 35.79	39.47 38.86	10.05 12.16
LDL-C >=130 mg/dl A B	35.69 37.26	31.18 31.03	27.51 29.15	25.99 26.28	-9.70 -10.92
Insulin A B	20.41 21.68	21.74 20.55	22.84 20.79	25.59 20.90	5.18 -0.78
>=2 antihypertensive agents A B	52.89 55.71	55.59 55.17	55.21 56.19	56.49 57.33	3.60 1.62
Statins A B	7.75 13.27	12.74 16.47	24.02 25.03	28.58 35.67	20.83 22.40

No conflict of interest

O-0419

Assessment of the risk of foot wound based on a systematic screening, designed for the professional practices evaluation necessary for French hospitals certification

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Aims: A professional practices evaluation based on the prevention of foot complications in diabetics led to create measures for professional practices improvement during the certification visit (V2), ordered by the French National High Authority for Health, in order to guarantee the best level of medical care. During the year 2005, more than 1000 diabetics were hospitalised in our department, 368 foot assessments and punctual prevention measures were provided. In a certification approach education tools should be improved, regular acts for prevention should be realised, and standardisation of health care follow-up should be also encouraged.
Methods: A form was thus created for the screening of all hospitalised diabetic patients, including foot grade. A short evaluation form was filled during all hospitalisations. An educational and playful tool was created: the 7 feet game, inspired by the famous happy families game. It was tested and validated for use, allowing weekly therapeutic education sessions. We evaluated these measures by analysing random diabetic patients files, in order to assess both the tools appropriation and the improvement of practices.
Results: Foot grade was mentioned in only 2% of the 57 files evaluated in 2005, 14% of the patients declared to know about prevention bases and 32% were taught for specific informations. These rates increased respectively in 2006 to 65%, 65% and 70%, and in both years 2007 and 2008 to 100%, 90% and 90%. A survey designed to know patient's risk perception in 2007 showed that 53% of them needed more information, 94% were aware about the risk, but less than 20% were able to give precise examples of adapted actions. Lastly, more than 80% were satisfied or very satisfied about their education session because of the game and estimated having increased their level of knowledge.

Conclusion: Obligation of assessment of professional practices in a certification approach allows to create new projects and to focus on perfectible domains.

No conflict of interest

O-0420

Characteristics of patients with type 2 diabetes referred for the first time to a diabetes clinic

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Aims: Recent results of large scale clinical trials have emphasized the importance of early intensive interventions on metabolic control and cardiovascular risk factors to reduce the burden related to diabetes complications. On the other hand, an aggressive approach aiming to reduce HbA1c below 6.5% in individuals with a long history of diabetes does not produce the expected benefits on cardiovascular outcomes. Starting from these premises, we evaluated the characteristics of patients with type 2 diabetes referred for the first time to a diabetes clinic.
Methods: A continuous quality improvement effort was promoted in Italy by the Associazione Medici Diabetologi and implemented by a network of diabetes outpatient clinics. Overall, 122 clinics participated, all using electronic medical record systems. A software was developed to enable the extraction from the clinical databases of the information needed for the analysis. Data on all patients referred for the first time to a diabetes clinic between 2004 and 2007 were analyzed.
Results: Overall, 102136 patients were seen for the first time during four years, representing on average 18% of all the patients cared for by the clinics. Fifty-seven per cent of patients were males; patients had a mean age of 64.6±11.7 years, a BMI of 29.6±5.3, and a diabetes duration of 7.3±8.2 years. Only 50% of the patients had HbA1c values ≥7%, while 14% were referred to specialist care with a value ≥9%. Nineteen per cent of the patients were still treated with insulin±oral agents, while 17% were on diet alone. Blood pressure levels ≥140/90 mmHg were found in 58.9% of patients, while LDL-cholesterol values ≥130 mg/dl in 35.2%.
Moreover, a wide variation in these patients characteristics among 18 different Italian regions was identified, in terms of mean age (from 61 to 68 years), average levels of HbA1c (from 6.6 to 8.0%), diabetes duration (from 6.0 to 10.4 years), and proportion of patients on diet alone (from 1.0 to 28.8%).
Discussion/conclusions: The evaluation of a large sample of individuals with type 2 diabetes seen for the first time in diabetes clinics shows that patients are usually referred to specialist care many years after diagnosis and frequently show poor metabolic control and very high cardiovascular risk profile. Organization of diabetes care at the regional level, and the degree of implementation of shared care programs between general practice and diabetes clinics, strongly influence the pattern of referral to specialist care. Major efforts are needed to improve communication and collaboration between primary and secondary care in order to provide better quality of care and reduce clinical and economic consequences of diabetes.

No conflict of interest

O-0421

English national diabetes strategy: understanding the drivers of improvement

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Service Quality is often intangible. If we measure tangible, easy-to-collect data, organisations may reach "target" without revealing service improvement (or not). Organisations may look good, without ***being*** good. We aim to break this cycle and reset expectations and performance at a higher level of quality and performance. In a service business this requires assessment of quality, capability and capacity delivered within available resources.
Aims: To develop and implement a series of measures to support people with diabetes, healthcare professionals and commissioners to raise the quality of diabetes care across a nation.
To respond to context and develop tools of improvement to support current and future clinical and national strategic needs.
To understand what is required by people with diabetes, healthcare providers, commissioners and organisations, and how to build the capability and capacity to ensure their needs are met.
Methods: Using a national network of stakeholders to work in specialist advisory groups, overseen by a national steering group, to work on fundamental issues of commissioning, information/audit and culture change in diabetes. This includes open space methodology to allow active national engagement, pilot and evaluation, literature review and development of guidance and standards to answer the question of 'how do we engineer quality improvement across a nation'. We have diabetes-related public health information for each locality and a national diabetes audit (NDA) covering about 75% of known patients. This will help commissioners and providers assess local needs, tailor local care, and audit outcomes.
Results: The combined outputs of the advisory groups via the Steering Group, have developed a programme of improvement to be delivered over four years. Open space events held include pregnancy issues and future national diabetes audit needs. New commissioning documentation is being developed using a 'Teams without Walls' integrated care model. An enhanced NDA is out to tender. Fundamental changes will be made in supporting commissioning, information/audit and a culture change to support people with diabetes in self care.
Conclusion / next steps: The next step is to establish national adult and paediatric networks that will assure the work of the Steering Group and Specialist Advisory Boards, and to offer the opportunity for all those delivering and receiving diabetes care to engage in the delivery of this programme of improvement, and raise awareness of the work. It is hoped that the national feedback may generate further innovation and improvements concepts for diabetes care.

No conflict of interest

O-0422

Transition of patients from a specialty diabetes program to a family health team: a work in progress

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Aims: As the prevalence of diabetes continues to increase, so do waiting times for specialty diabetes services. Discharge of individuals from specialty diabetes programs to primary care have not been well studied despite the introduction of interdisciplinary teams into many primary care offices. The aim of this project was to identify the criteria and process that would support the transfer of patients from a specialty diabetes program to primary care.
Methods: The participating diabetes program had two sites to the program: a nurse/dietitian model and a team led by diabetes physician specialist. Twelve primary care physicians, one endocrinologist and a diabetes nurse and dietitian agreed to participate in the pilot project. We retrospectively studied a cohort of common patients followed by the specialty diabetes program and primary care, who were seen between January to November 2007 by diabetes program site and provider. Participating primary care providers and diabetes specialty staff were each requested to review their own patients' clinical data and determine

if their diabetes care could be returned to primary care. The rationale for this determination was then collated, and informed the development of agreed-upon criteria for discharge. A discharge summary was developed to support the transfer of relevant clinical information back to primary care to support the transition.

Results: There were 113 patients at the nurse/dietitian site of the program and 67 patients at the other site on program for the participating primary care practices. Only 16 out of the 67 patients belonged to the participating endocrinologist and were included in the project. Application of the methodology identified 12 matching discharge criteria and identified 57 patients for discharge at the nurse/dietitian site (50%) and 2 out of the 16 patients from the endocrinologist team (12%). At the nurse/dietitian site, 26 of the 57 patients (45%) were related to patients not attending the diabetes program hence "falling off" the system. This was a significant finding since neither party was aware of these patients' diabetes status. A discharge summary form was pilot tested to support this transition and received positive feedback from the participating primary care practices.

Conclusion: This project suggests that discharge criteria and a transition process can be established between primary care and specialty diabetes programs to support the appropriate use and access of diabetes education and management resources.

No conflict of interest

O-0423

The rehabilitation publication fulfils needs

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Background: Education and counselling are vital preconditions for coping with illness in the treatment of persons with type 1 diabetes. Knowledge and instructions alone do not help in self-care, treatment motivation or changing one's way of life. In the complex modern world persons with diabetes must be able to solve problems and apply information in practice.

Methods: The group of twelve diabetes-professionals planned the Personal treatment and rehabilitation plan for adult persons with type 1 diabetes in Finland. In making the plan, the key idea was how to implement existing guidelines and recommendations to every-day diabetes-care and to improve the quality of counselling results. The publication was completed in two parts in autumn 2008. The first part helps health care professionals recognise rehabilitation needs of persons with diabetes. The second part has been designed for persons with diabetes to help them with disease management and to live a fuller life.

Results: Finnish Diabetes Association conducted a survey in spring 2009 to explore how health care professionals have become acquainted with the publication. The survey was web-based and it was sent in Finland to health care professionals who deliver diabetes care. The survey was conveyed by a contact person in every 21 hospital districts in Finland. About 1 000 surveys was sent and slightly over 600 answers (61%) were received. The most answers were from diabetes-nurses (57% of respondents). Other subgroups were medical doctors (29% of respondents) and other health care professionals (14% of respondents), like dieticians, podiatrists and health care leaders.

Regarding the survey, the publication has proven its importance in everyday health care. There are about half of the professionals who haven't seen the publication, but of remaining 50% a quarter uses the publication in everyday education and counselling of persons with diabetes.

Conclusion: The quality of diabetes care is in great extent based on training and competence of the health care professionals. Persons with type 1 diabetes are treated in central or university hospitals straight after they are diagnosed, but resources are not enough for them to be treated there all the time. Therefore community health centres must cooperate. In addition, the treatment of persons with diabetes as such is marked by regional and local divergences. In order to diminish the divergences, more attention has to be paid to the development of further education and counselling in future. The personal treatment and rehabilitation plan is a great help with that. It has proven its importance.

No conflict of interest

O-0424

Access to insulin and diabetes care in developing countries – the experience of the International Insulin Foundation

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Introduction: The International Insulin Foundation (IIF) has as its aim to prolong the life and promote the health of people with diabetes in developing countries by improving their access to insulin and diabetes care. In order to meet these objectives the IIF developed a process to provide an in-depth in-country assessment to assist countries in improving their medicines supply and health system, the Rapid Assessment Protocol for Insulin Access (RAPIA).

The RAPIA has been implemented in Mozambique (2003), Zambia (2003), Mali (2004), Nicaragua (2007) and Vietnam (2008). It has also been implemented in the Philippines by the WHO, and the implementation in Vietnam was supported by the IDF Task Force on Insulin, Test Strips and Other Diabetes Supplies.

Methods: The RAPIA provides a practical field guide to assist teams in the collection, analysis and presentation of data to evaluate and inform the development of health care services for diabetes management in low and middle income countries.

Results: From the results of the different countries using RAPIA, it is important to look at the issue of affordability and accessibility of insulin at different levels of the health system; namely the central, facility and individual patient as well as the private sector.

Equally as important is that insulin alone is not sufficient for diabetes care. Syringes are needed to deliver it, testing equipment is needed for initial diagnosis and follow-up, as well as trained healthcare workers to prescribe, monitor and adjust dosage, and a health system capable of managing diabetes, including patients with complications.

Factors of affordability and accessibility also impact the person with diabetes' access to these aspects.

Discussion: The supply of insulin alone will not improve outcomes for people with diabetes. Insulin, syringes and testing equipment need to be present at the adequate facilities with the right infrastructure and personnel. The IIF has identified 11 points necessary for a "positive" diabetes environment and two relate directly to the issue of affordability and availability of insulin, but the issue of improving the lives of people with Type 1 diabetes needs to look beyond this.

The use of the RAPIA as a tool to improve diabetes care in resource poor settings has now been adopted by the WHO Essential Drugs Division and the IDF Task Force on Insulin, Test Strips and Other Diabetes Supplies and is being developed into a standardised tool and implemented in different countries to clearly identify the barriers to access and develop recommendations for action.

No conflict of interest

O-0425

What is the best practice of alcohol drinking associated with the lowest risk of diabetes in Canadian adults ?

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Aims: Several epidemiological studies have shown that moderate alcohol consumption has a protective effect on the risk of diabetes. Drinking moderately reduces the risk of diabetes, largely by raising HDL-cholesterol levels, reducing inflammation and improving the blood vessels' ability to respond to demands on the cardiovascular system, which are linked to diabetes risk. The objectives of this study were to examine how often and how much to drink alcohol in order to approach the lowest risk of diabetes in Canadian adults.

Methods: Data used in this study are from the 2005 Canadian Community Health Survey Cycle 3.1. Residents of Indian reserves, institutions, some remote areas and military bases are not included in the survey. Using data for Canadians aged 45 and older, our analyses were implemented in two steps. In the first step, we used multivariate logistic regression to examine the risks of diabetes for various frequencies of alcohol consumption while controlling for demographical, socioeconomic and lifestyle factors. Next, we examined whether the amount of alcohol consumed changes the likelihood of reporting diabetes for those people who drink at the frequency associated with the lowest risk for diabetes. The bootstrap technique was used to test the statistical significance of odds ratios and to estimate 95% confidence intervals.

Results: We found the best protective effect of alcohol drinking for diabetes is

drinking more than once a week for men and at least once a week for women, respectively. In men significant higher risks of diabetes are found in men who do not regularly drink (odds ratio (OR): 2.04 [95% Confidence interval (CI): 1.73-2.41]), drink less than once a month (OR: 2.28 [95%CI: 1.92-2.71]), drink less than once a week (OR: 1.40 [95%CI: 1.16-1.70]) and drink once a week (OR: 1.44 [95%CI: 1.16-1.78]) compared to men who drink more than once per week. Similar elevated diabetes risks were found in women who do not regularly drink (OR: 3.19 [95%CI: 2.67-3.79]), drink less than once a month (OR: 2.17 [95%CI: 1.79-2.63]), and drink less than once a week (OR: 1.36 [95%CI: 1.09-1.71]) than who drink at least once per week. No significant difference of diabetes risk was found for the amount of alcohol consumed in regular drinking in both men and women.

Conclusions: This study has confirmed the protective effect of regular alcohol consumption for diabetes risk. However, heavy alcohol use should always be avoided since it can cause fatty liver and alcohol hepatitis, chronic inflammation of the pancreas, brain damage, some types of cancer, kidney failure, physical and behavioral abnormalities in the fetus and other complexities.

No conflict of interest

OPEN FORUM

LIVING WITH DIABETES

Music as a medium of communication

0426

Music as a medium of communication

E. Yamin[1]
[1] *Los Angeles, USA*

As Yamin remains in the spotlight, he plans to use his celebrity to educate the public about type 1 diabetes and to encourage young people with diabetes to reach for their dreams.

This article was originally published in Diabetes Health in February, 2008.

With his naturally soulful singing voice, listeners feel his raw emotion and they like it. When you hear him, you know immediately that few guys in any musical genre sing with this kind of authenticity.

There's also an innocence about him. Watching Yamin grow from nobody to somebody, while carrying his diabetes proudly, has inspired diabetics everywhere.

Yamin had sung karaoke as a teen, which was how he had discovered his own talent. The untrained youth began singing in local bands and in amateur venues, and his influences came to include the likes of Whitney Houston, Stevie Wonder, Tony Bennett and Ray Charles.

Regimen on the Road: The ideal daily regimen for optimal control is not easy on the road, says Yamin, who has been traveling.

It's very important to have good blood glucose control before going on stage, says Yamin, who tests with his meter before and after going on stage. Hypoglycemia on stage could mean devastating effects on a performance - and not just because of the low blood glucose level, but also because it's hard to get up fast in front of a waiting audience.

One time this was not the case.

"I stepped on stage, opened up with the first song and I felt my blood glucose dipping down pretty low," Yamin explains of the incident. "I asked somebody to go grab me a couple of Pepsis and I finished the first song. But, between the first two songs I sucked both of them down pretty quick. I had to correct my blood glucose fast."

He explained to his audience what was going on at that point - openness about his diabetes with his fans has always been a strength for Yamin, from his first American Idol performance when he was very clear with the judges about his disease.

The problem came once he was done drinking.

"I drank the two Pepsis very fast. You don't really want to drink carbonated beverages on stage," he says. "It was hard not to burp on stage after that. It was ugly, man. It was just ugly. I kept having to pull away from the mike to burp."

Hypoglycemic episodes are not common for Yamin on stage.

"I notice my blood glucose level gets higher on the road," he says. "I've been on the road maybe a total of seven months, adding everything up on three tours."

There isn't always time on the road to do the exercise he would like to.

"I go to bed around 4 or 5 in the morning and wake up early to do morning radio shows, do sound checks, meet and greets on the shows," Yamin explains of his days on tour. "I do everything I can to promote every show in every town I go to. My time is very limited. I'm very busy - the first single has just been very busy and very taxing."

Yamin says although his most recent hemoglobin A1c was 8, he has plans to get his diabetes in tighter control, he advocates a healthy lifestyle and he knows his results would be more favorable if he were not traveling from city to city, riding the tour bus and airplanes constantly.

No conflict of interest

0427

Music as a medium of communication

J.L. Colquhoun[1]

My life is the synopsis of an opera - comedy, tragedy, romance, determination, passion and a message.

Music has moulded my life. Although living with Type 1 diabetes since age 10, I refused to let anyone or anything stop me.

Diabetes gave me the drive and passion to succeed in music – I always felt I needed to prove to everyone I could be a successful international opera singer, travel the world, keep irregular hours and party hard despite living with diabetes.

I have sung with international opera companies in Australia and Germany and presented recitals and concerts in London, Paris, Bermuda, Seoul and Chicago. After my full-time opera career was cut short by diabetes related blindness, I used music to spread the message.

I have already told my story – music; diabetes; blindness; cancer; dialysis; a kidney pancreas transplant; overseas travel; my entertainment and production company; involvement on health, disability, arts, advocacy and support boards and committees - to health professionals and consumers around the world.

A guest speaker finishing with a song (or three), a person experiencing chronic illness and disability yet exhibiting a positive attitude and passion for life, has proven very successful in spreading the diabetes message.

Music is the means I use to communicate the message of healthy living, diabetes, prevention of chronic illness and complications.

No conflict of interest

OPEN FORUM

Life for a Child Program documentary

0428

Life for a Child Program documentary

G. Ogle[1]
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In the developed world, children with diabetes have access to full care, and grow up to lead healthy and productive lives. In contrast, children with diabetes in low-income countries frequently die or remain chronically unwell with early development of complications, as insulin and other components of care are unavailable or unaffordable. The International Diabetes Federation ***Life for a Child*** Program supports diabetes centres in 19 countries around the world. Over 1,200 children benefit directly from the program, which provides insulin, monitoring, education, capacity building, and technical advice as needed.

A documentary on the Program has recently been produced by the IDF and Eli Lilly and Company. This shows the lives of three children with diabetes in Nepal. ***"Life for a Child"*** was filmed in bustling Kathmandu and the rugged mountainous Sindhuli region. The film powerfully and movingly demonstrates how the diagnosis of diabetes has affected their and their families' lives, and how with courage and sacrifice they are overcoming this challenge.

The film premiered at the Tribeca Film Festival, and was awarded Best Short Documentary at the Film Festival in San Jose California in March 2009.

For further information, please visit www.lifeforachild.org

No conflict of interest

NAMED LECTURE

CLINICAL RESEARCH

UN/UNESCO Helmut Mehnert Award Lecture

0429

How the seeds of adult adiposity and diabetes are sown in the womb

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Conventional model of aetiology of adiposity and type 2 diabetes (T2D) envisages a role for genetics, aging and unhealthy lifestyle. Role of intrauterine environment has been highlighted over last 3 decades.
Children of mothers who were pregnant during the Dutch Hunger Winter were obese if they were exposed in the first two trimesters. Frienkel and colleagues demonstrated that maternal diabetes led to a range of developmental problems (anomalies, neurocognitive affection, adiposity and T2D) depending on the time of exposure in pregnancy, and coined the term 'fuel-mediated teratogenesis'. Hales and Barker demonstrated an inverse association between birth weight and T2D. They proposed that maternal undernutrition was an important factor in fetal 'programming' of T2D.
Approximately a third of babies in the Indian subcontinent are born low birth weight, and India is the world's capital of diabetes. Research in India has linked low birth weight and short length with later T2D. Pune Maternal Nutrition Study highlighted the role of maternal nutrition in fetal growth and demonstrated that the relatively thin and short Indian babies are more adipose (higher body fat percent) compared to European babies. Low circulating levels of maternal vitamin B12 but high levels of folate predicted childhood adiposity and insulin resistance. We have called this 'nutrient mediated teratogenesis'. In urban India micronutrient undernutrition and gestational diabetes may combine to produce larger effects.
Animal models demonstrate the importance of periconceptional nutrition in fetal programming. This is thought to result from altered gene expression ('epigenetics'). DNA methylation (influenced by folate and vitamin B12) and histone acetylation are proposed mechanisms. Periconceptional exposure to Dutch Hunger Winter was associated with hypomethylation of IGF2 gene.
These ideas are the basis of Developmental Origins of Health and Disease theory (DOHaD). Improvement of health and nutrition of young girls might contribute to prevention of adiposity and diabetes.

No conflict of interest

0430

Appetite control networks and the metabolic syndrome: a step towards type 2 diabetes?

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The thrifty genotype gives rise to a metabolic phenotype that is designed for a simpler lifestyle, when food is only periodically abundant and requires energy expenditure to be obtained. An appetite control system that permitted excess food ingestion when food is available would also have evolutionary benefit in a hunter-gatherer society. Neither is beneficial in societies with reduced requirement for physical exertion and easy availability of energy-rich food. We and others are seeking evidence for treatable changes in appetite control systems that might upset the ability to control energy balance and normal weight maintenance in people with or at high risk for obesity and diabetes. We have found an insulin-sensitive element to brain glucose metabolism which is less effectively stimulated by insulin in people with peripheral insulin resistance. Specifically, insulin stimulation of brain glucose uptake and metabolism (surrogate markers of neuronal metabolism) was less effective in brain regions involved in appetite and satiety. In contrast, brain regions normally activated by anxiety and need for increased vigilance were equally suppressed by insulin in insulin resistant and sensitive subjects. This combination might underlie impaired satiety sensing and increased comfort after eating in insulin resistance, which would tend to drive further eating. Using functional magnetic resonance imaging, altered hypothalamic responses to food ingestion in obese and Type 2 diabetic individuals have been reported. We have found changes in the extent of brain activation in appetite control centres and in the visual cortex in insulin resistance after nutrient ingestion. Food ingestion can also be shown to influence the brain's response to subsequent food cues. The techniques used in these studies are now available to seek differences in the brain's ability to control appetite and food intake and explore new therapies to target overeating, obesity and progression from insulin resistance to Type 2 diabetes.

Conflict of interest:
Paid lecturing: Eli Lilly, Amylin Inc
Advisory board: Amylin Europe, NovoNordisk UK, Eli Lilly UK
Commercially-sponsored research: Eli Lilly UK

MEET-THE-EXPERT

In-hospital glycaemic management of diabetes

0431

In-hospital glycaemic management of diabetes

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There is substantial observational evidence linking hyperglycemia in hospitalized patients (with and without diabetes) to poor outcomes. Although, several cohort studies as well as early randomized clinical trials (RCTs) suggested that tight glucose target (80 to 110 mg/dL [4.4 to 6.1 mmol/L]) improved clinical outcomes (reduced hospital complications and mortality), this target has been difficult to achieve without increasing the risk for severe hypoglycemia. In addition, recent RCTs in critically ill patients have failed to show a significant improvement in mortality or have even shown increased mortality risk with intensive glycemic control.
The 2009 AACE and ADA task force on inpatient glycemic control guidelines recommended raising glycemic targets in the ICU and non-ICU setting. For the majority of patients in the ICU setting, using insulin infusion and targeting blood glucose levels between 140 and 180 mg/dL (7.8 and 10.0 mmol/L) is recommended. Despite the lack of strong scientific evidence, lower glucose targets between 110 and 140 mg/dl (6.1 and 7.8 mmol/L) may be appropriate in selected ICU patients (i.e., ICUs with extensive experience and appropriate support, CABG surgical patients, stable glycemic control without hypoglycemia, total parenteral nutrition). Blood glucose targets > 180 mg/dl or < 110 mg/dl are not recommended.
For the majority of noncritically ill patients treated with insulin (or insulin secretagogues), the new ADA/AACE guidelines recommended maintaining a pre-meal BG target between 100 and 140 mg/dL (5.6 and 7.8 mmol/L), with random BG <180 mg/dL (10 mmol/L), as long as this target can be safely achieved.
This meet-the-professor session will discuss the evidence in support of improving glycemic control for inpatients with hyperglycemia, recommended glycemic targets in different patient populations, treatment options available for safely achieving glycemic targets avoiding hypoglycemia, available strategies for transitions to outpatient care, and areas of need for future research.

Conflict of interest:
Commercially-sponsored research: Research grant support from Sanofi-aventis, Novo Nordisk, and Baxter.

MEET-THE-EXPERT

Assessment of cardiovascular risk in type 2 diabetes

0432

Assessment of cardiovascular risk in type 2 diabetes

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Type 2 diabetes (T2D) and cardiovascular disease (CVD) arise together from a "common soil" of obesity and insulin resistance. This risk state is identifiable by the presence of T2D and CVD risk factor clustering, or "metabolic syndrome." Metabolic syndrome recognizes that CVD risk factors are T2D risk factors and vice versa, and that the joint presence of several even mildly abnormal risk

factors heightens risk for future disease. Metabolic syndrome predicts CVD, but is especially useful to predict T2D.
The coincident development of T2D and CVD probably explains some of the persistent excess risk of CVD in T2D observed over past decades. T2D confers an at-least two-fold increased risk for all types of CVD, including CHD, PVD, stroke, and death, and shortens life by a dozen years from CVD. In addition to metabolic syndrome risk factors, additional novel risk factors increase CVD risk in diabetes, including insulin resistance and endothelial dysfunction. These markers point to novel disease pathways that may be used to aid T2D prevention and treatment.
However, in T2D, novel risk factors do not seem to add too much to discrimination of future CVD risk. Here, standard risk factors continue to be the most useful clinical discriminators of higher versus lower-risk individuals. Standard risk factors also continue to be the target to prevent T2D (obesity, sedentary lifestyle, poor diet), and treatment in T2D to prevent CVD events (glycemia, blood pressure, lipids, smoking, aspirin). The long-term follow-up of the UKPDS study shows that better glycemic control ultimately reduces risk for CVD as well as diabetic microvascular disease. Combined with attention to all standard risk factors, the Steno 2 Study shows that intensive multifaceted standard risk factor management in T2D is a very powerful approach to prevent vascular complications.

Conflict of interest:
Advisory board: Eli Lilly

DEBATE

Glucose-lowering for the prevention of cardiovascular disease: positive, negative or neutral?

0433

For

H.C. Gerstein[1]
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People with type 2 diabetes are 2-3 times more likely to die from cardiovascular disease than people without diabetes. Moreover, the higher the HbA1c level, the higher the risk of fatal and non-fatal cardiovascular disease. Four trials published in 2008 assessed whether targeting normal glucose levels reduces cardiovascular events in people with type 2 diabetes: long-term follow-up of the UKPDS study of people with ***newly diagnosed diabetes*** and the ACCORD, ADVANCE and Veterans Administrations (VA) Trial in people with long duration type 2 diabetes.
The UKPDS showed that intensive glucose control reduced eye and kidney disease by 25% after 10 years and myocardial infarction and death by 15 and 13% after an additional 8 years of passive follow-up. ADVANCE showed that intensive glycemic control reduced the risk of composite outcome of either micro or macrovascular disease, reflecting mainly diabetic nephropathy with no effect on cardiovascular events or mortality. The VA trial showed no significant effect on any of its outcomes. The ACCORD study was stopped early because of increased mortality in the intensive group after 3.5 years. At that time there was also a 25% reduction in myocardial infarction and a 30% increase in cardiovascular death.
The most conservative interpretation of these trials is:

a. A policy of tight glycemic control can reduce eye, kidney, vascular consequences and mortality in people with new type 2 diabetes, and reduce renal disease in people with established type 2 diabetes.
b. Such a policy has uncertain effect on cardiovascular disease in people with well-established type 2 diabetes; some studies suggest a neutral effect, others suggest reduced myocardial infarction but increased cardiovascular death, and others show no effect.
c. More data are expected over the next 3 years.

Therapy for an individual patient needs to be individualized depending on his or her circumstances.

Conflict of interest:
Paid lecturing: GSK, Sanofi Aventis, Novo Nordisk, Lilly, Bayer
Advisory board: GSK, Sanofi Aventis, Novo Nordisk, Lilly, Astra Zeneca, BMS
Other substantive relationships: Grants from GSK, Sanofi Aventis

0434

Against

M. Cooper[1]
[1] *Baker IDI Heart & Diabetes Institute, Diabetes Division, Melbourne, Australia*

Although epidemiological studies have demonstrated a clear relationship between plasma glucose levels and cardiovascular events and mortality, clinical trials have not been able to show significant benefits on cardiovascular endpoints with intensified glycaemic control. In the original UKPDS, a modest reduction in cardiovascular events was observed but this did not reach statistical significance. Since that time, 3 large studies (VADT, ACCORD and ADVANCE) have reported no benefit of intensification of glycaemic control on cardiovascular disease and in particular mortality. Indeed, in the ACCORD study there appeared to be an adverse outcome in terms of cardiovascular and total mortality with an aggressive blood glucose lowering regimen.
The underlying explanation for the failure of glucose lowering to confer major benefits on the macrovasculature remains elusive. It is possible that once there is established vascular disease, it is very difficult to reverse the disease process. Indeed, pathways linked to hyperglycaemia-induced end-organ injury such as advanced glycation may lead to accumulation of products within the blood vessels which have slow turnover and/or are difficult to degrade. In addition, the phenomenon of "metabolic memory" where vascular injury progresses despite restoration of better metabolic control may be operating, with increasing data suggesting that oxidative stress pathways, possibly activated by epigenetic mechanisms, promote ongoing vascular injury in diabetes.
In summary, there remain no convincing data, including from recent large well performed multinational clinical trials, to recommend intensification of treatments that reduce blood glucose as a first line approach to reduce the cardiovascular burden in diabetes. Indeed, other non-glycaemic approaches such as lipid and blood pressure lowering regimens may be more appropriate as the central focus for the prevention and management of cardiovascular disease in diabetes.

Conflict of interest:
Paid lecturing: Servier
Advisory board: Servier

MEET-THE-EXPERT

HEALTHCARE AND EPIDEMIOLOGY

International diabetes management practices study (IDMPS)

0435

IDMPS: background, aims, target population, tools and methodology and programme implementation

P. Aschner[1]
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Background and aims: Despite the findings of the DCCT and the UKPDS and the recommendations of the ADA, EASD and IDF, a large number of people with diabetes are not well controlled. The IDMPS is an international, multicenter, observational study designed to raise awareness by documenting the current practices in type 1 and type 2 diabetes management worldwide, their compliance with management guidelines and their trends over time. It can also help identifying predictors of treatment goals achievement and diabetes-related hospitalisations and absenteeism and to estimate resource consumption.
Material and methods: IDMPS is a 5-year study with 5 waves. Each wave consists of a cross-sectional period and a 9-month longitudinal follow-up. Physicians were randomly selected among diabetes specialists as well as other specialists and general practitioners with experience in insulin therapy, and requested to enrol the first 10 patients with type 2 diabetes (T2D) and the first 5 patients with type 1 diabetes (T1D) who visited their office during a 2-week recruitment period.
In this session we report results from data collected during the first two cross-sectional periods (2005 & 2006) in 18 countries within Africa, Asia, Eastern Europe, the Middle East and Latin America comprising almost 25.000 people with T2D and 1.898 people with T1D.

Study implementation: A steering committee advised the project team on study design and registry structure, monitored study progress, reviewed and validated all study-related documents, and proposed and approved decisions on protocol amendments, analyses, and publications.

Conflict of interest:
Paid lecturing: P.Aschner: lecturing for Sanofi Aventis
Advisory board: P.Aschner: Advisory Board for Sanofi Aventis

0436

Diabetes care quality: clinical profile, care processes and metabolic outcomes

J.C.N. Chan[1]
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Objectives: To document changes in diabetes practice in developing areas with a 5-year survey.
Research and methods: In 2005, during a 2-week period, 937 doctors from 18 countries enrolled 5888 diabetic patients from Asia, 3519, East Europe and 2116, Latin America. Collected data included clinical parameters, self-care, access to education, follow-up patterns, work absenteeism and hospitalizations. Treatment goals were defined as HbA_{1c} <7%, BP <130/80 mmHg and LDL-C<100 mg/dL.
Results: In 9901 type 2 diabetic (T2DM) patients, 10% reported hospitalization or absenteeism from work in the last 6 months, 33% have no health coverage, 36% never had HbA_{1c} measured and 11-36% have not screened for chronic complications in the last 2 years. In all 3 regions, 20-40% of patients were at target for HbA_{1c}, BP and lipids. In patients with all three risk factors measured (n=3896), only 3.6% attained all 3 targets. Clinical profile was similar across 3 regions (means: age 58 years and disease duration 8 years), with Asians having the lowest BMI and waist circumferences. Overall, 3% of patients were treated only with diet and exercise, 66% with oral glucose lowering drugs (OGLDs) alone and 31% with insulin with or without OGLD. Overall, 42% never received diabetes education, 32% performed SMBG and 8% belonged to a diabetes association.
Conclusions: While T2DM patients from developing areas have differences in clinical profiles, they share similar care patterns with suboptimal performance indicators in terms of processes and outcomes. Such performance must be improved in order to get better outcomes and decrease the socioeconomic burden of diabetes.

Conflict of interest:
Paid lecturing: Juliana CN Chan
Stock ownership: nil
Advisory board: Juliana CN Chan
Employee: nil
Commercially-sponsored research: IDMPS is supported by an unrestricted grant from aventis sanofi
Other substantive relationships: nil

0437

Prescriptive style and predictors of treatment goals achievement

A. Ramachandran[1]
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Objective: To study medication use and predictors for attaining glycemic goal (A1c<7%) in people with diabetes from developing areas.
Subjects and methods: During a 2-week period in 2005, 937 doctors from 18 countries recruited 1898 T1DM patients and 9901 T2DM patients from Asia, East Europe (EE), Latin America (LA). Collected data included medical history, drug use, self monitoring of blood glucose (SMBG), access to diabetes education and physicians' perception of glycemic control status.
Results: In 1898 T1DM patients, the commonest insulin regimens were basal plus bolus in LA and EE and premix regimen in Asia. Mean insulin dose ranged from 0.5 to 0.8 IU/kg with the highest values for basal plus bolus regimen. In 9901 T2DM patients, 3% were treated with lifestyle modification, 66% with oral glucose-lowering drugs (OGLD) and 31% with insulin, with or without OGLD. In both T1 and T2DM patients, 20-30% achieved glycaemic goals (A1c<7%) with physicians tending to overestimate their control status. In T1DM, diabetes education and SMBG predicted glycemic control in all regions. In T2DM, despite regional heterogeneity for predictors, short disease duration and use of fewer drugs predicted A1c<7% in all regions. Other predictive factors included old age (Asia/LA), normal weight, SMBG and self adjustment of insulin (Asia), access to educators and adequate coverage for health care (SA).
Conclusions: These results suggest that early diagnosis, prompt intervention and self-management are important determinants for attaining glycemic goals with factors pertinent to patients, care providers and system all having impact on quality of care.

No conflict of interest

0438

Resources consumption: direct medical and indirect costs

J.J. Gagliardino[1]
[1] *on behalf of the IDMPS investigators, CENEXA (UNLP-CONICET LA PLATA), La Plata Buenos Aires, Argentina*

Aims: To estimate resource consumption by people with type 2 diabetes (T2DM) in 24 countries.
Methods: Cross-sectional observational record of resource use in 15,016 people with T2DM (Asia 4678, Latin America [LA] 6090 and Middle East & Africa [ME&A] 4248), within the second wave of IDMPS. Annual quantities (mean ± SD) were measured, and predictors of diabetes-related hospitalisations and absenteeism were determined using negative binomial regression.
Results: Patient doctor visits: 3.4 ± 6.9, 5.4 ± 6.7 and 2.5 ± 4.4 times/year in Asia, LA and ME&A, respectively. Percentage of hospitalization: 8.5%, 6.5% and 8.8%; average stay: 3.8 ± 18.1, 2.2 ± 13.9 and 2.6 ± 13.5 days/year, respectively (total of 42.000 days/year). Mean days of absenteeism: 5.0 ± 23.1, 6.4 ± 33.2 and 5.7 ± 24.3 in the regions (total of 86.000 days lost/year). The regression analysis showed that chronic complications and inadequate glycaemic control (HbA1c > 7.0%) were the major predictors of resource use. The annual hospitalisation rate was significantly greater in patients with than without macrovascular complications in Asia (incidence rate ratio (IRR) 4.7, 95% CI 2.8-7.8, n2551), 5.4 times greater in LA (IRR 5.4, 95% CI 3.0-9.8, n 3228) and 4.4 times greater in ME&A (IRR 4.4, 95% CI 2.8-6.9, n2630).
Conclusions: In developing countries, micro- and macrovascular complications and inadequate glycaemic control are significant predictors of resource use in T2DM. These results confirm the importance of appropriate diabetes control to prevent the development/progression of chronic complications and the consequent increase in the cost of care.

No conflict of interest

MEET-THE-EXPERT

EDUCATION

Training foot care assistants in Jamaica and the Caribbean

0439

Training foot care assistants in Jamaica and the Caribbean

O. Bernard[1]
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Diabetic foot is a major problem that can lead to other complications for both the patient and the Health Care givers. Foot Care is still regarded as a minor matter and is still not yet fully understood and appreciated. There are so many risk factors that need to be looked at and indeed it can so easily be recognized at primary care level. We talk about the Diabetic foot but what we should be saying is "prevent the diabetic foot with simple interventions".
Diabetes management embraces a multidisciplinary approach because diabetes affects the eyes, heart, kidneys and the limbs. With this in mind, you need the team. The team should and must include the Chiropodist/Podiatrist. However, sad to say, there are none in any of the Government Hospitals/Clinics here in Jamaica and indeed the Caribbean.
The solution is to train Foot Care Assistants to meet this shortfall. In Jamaica, we have developed the Foot Care Assistant programme whereby we have been training Community-based people to deal with the basic foot problems such as nail problems, corn, calluses, etc. As a result of the success of this programme, it has been exported to other Caribbean Islands such as Bahamas, Belize etc.
Before, we did not have any formal foot clinic where foot care was offered

to clients by trained people. I am pleased to say that that has now changed; many of our clinics are now offering such service. The outcome of this simple intervention is almost immediate.
Additionally, since the start of this programme, Foot Care is now recognized as part of the routine screening programme. The next phase is to offer the work through the University of Technology.

No conflict of interest

MEET-THE-EXPERT

Is self-monitoring useful in type 2 diabetes: what is the evidence? in whom?

0440

Is self-monitoring useful in type 2 diabetes: What is the evidence? In whom?

O. Schnell[1]
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Diabetes is globally increasing at the rate of an epidemic. In the majority of patients however, the targets for glycemic control of diabetic patients, which are recommended by national and international guidelines of scientific associations, are not achieved.
Longer-term near-normal glycemia is critical for the prevention of micro- and macrovascular complications. The evidence is growing that postprandial blood glucose excursions and glycemic variability are associated with vascular damage and, therefore, may be harmful for diabetic patients. Concomitant structured self-monitoring of blood glucose enables the visualization of individual levels of glycemia and is essential for an optimized diabetes management. In both diabetic patients with and without insulin, long-term optimized diabetes management in the range of near-normoglycemia cannot be achieved without the implementation of self-monitoring of blood glucose (SMBG). Simply measuring HbA1c is not enough: Patients with identical HbA1c-levels may have significantly different glucose profiles. Both severe and smooth glucose excursions of glucose levels may result in comparable HbA1c values. These can be visualized by SMBG.
It goes without saying that SMBG has to be accompanied by structured educational programmes, which do not only empower patients to modify nutrition and physical activity according to the measured blood glucose values, but also encourage them to critically look at targets of metabolic control and also to potentially suggest the need for an alteration of medication. Patients (and physicians) must be well trained to convert data into meaningful information and appropriate therapeutic action. Clearly, this requires a substantial commitment for diabetes care from the patients themselves each and every day!
The Global Guidelines for treatment of patients with Type 2 Diabetes of the International Diabetes Federation (IDF) and the IDF Guidelines for Postmeal Glucose Management are a major achievement in the process of standardization of global diabetes care. The guidelines present pathways for clinical practice based on the current scientific evidence. The guidelines emphasize that SMBG is an integral part of self-management.
The Guidelines on Diabetes, Prediabetes, and Cardiovascular diseases of the European Society of Cardiology (ESC) and the European Association for the Study of Diabetes (EASD) also emphasize the importance of self-monitoring of blood glucose. In the ESC/EASD Guidelines, SMBG is presented as a major part of comprehensive management to reduce cardiovascular risk in patients. The Guidelines recommend SMBG due to studies which demonstrated that SMBG is associated with an improvement of glycaemic control.
Apart from the new global guidelines, the level of implementation of self-monitoring of blood glucose for diabetes management varies significantly among different countries. A homogeneous, structured and evidence-based approach across the national borders is still missing. Subsequently, this leads to major differences in medical care of diabetic patients across the world.

No conflict of interest

MEET-THE-EXPERT

FOUNDATION SCIENCE

Insulin signalling - where and how to study it?

0441

Insulin signalling - where and how to study it?

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At the molecular level, insulin signaling begins when activation of the insulin receptor (IR) results in tyrosine phosphorylation of several substrates, including the IR substrate 1 (IRS-1) and IRS-2. After tyrosine phosphorylation, IRS-1 and IRS-2 bind and activate the enzyme phosphatidylinositol 3-kinase (PI3-K). The activation of PI3-K increases serine phosphorylation of protein kinase B (Akt), which in turn stimulates the glucose transport in the muscle and adipose tissue, stimulates glycogen synthesis in the liver and muscle, and stimulates lipogenesis in the adipose tissue. Therefore, the PI3-K/Akt pathway has an important role in the metabolic effects of insulin. In the hypothalamus, the activated PI3-K/Akt pathway suppresses feeding, and insulin resistance in this tissue has recently been described.
Protein tyrosine phosphatase (PTP1B) has been implicated in the negative regulation of insulin and leptin signaling. PTP1B knockout mice are hypersensitive to insulin and leptin and resistant to obesity when fed a high-fat diet. In this presentation we will show the role of hypothalamic PTP1B in the regulation of food intake, insulin and leptin actions and signaling in rats through selective decreases in PTP1B expression in discrete hypothalamic nuclei. We generated a selective, transient reduction in PTP1B by infusion of an antisense oligonucleotide designed to blunt the expression of PTP1B in rat hypothalamic areas surrounding the third ventricle in control and obese rats. The selective decrease in hypothalamic PTP1B resulted in decreased food intake, reduced body weight, reduced adiposity after high-fat feeding, improved leptin and insulin action and signaling in hypothalamus, and may also have a role in the improvement in glucose metabolism in diabetes-induced obese rats. In conclusion, it is important to emphasize not only the insulin signaling in classical insulin-sensitive tissues, such as liver, muscle and adipose tissue, but also the hypothalamus, which has a role in the control of peripheral glucose metabolism.

No conflict of interest

MEET-THE-EXPERT

ASSOCIATION DEVELOPMENT

Prevention initiatives for type 1 diabetes and type 2 diabetes

0442

Cost-effective and simple strategies so that we do not miss the diagnosis of type 1 diabetes: the Parma Campaign

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Diabetic ketoacidosis (DKA) in children with type 1 diabetes at onset is generally related to a long duration of misdiagnosed hyperglycemia-associated symptoms. In the period of 1991–1997, we demonstrated that, thanks to a physician campaign centred on the earliest symptom of diabetes (nocturnal enuresis in a "dry" child) as reported by 89% of parents, it was possible to shorten the latency period and to prevent DKA. Due to this program, cumulative frequency of DKA at diagnosis decreased from 78% during 1987-1991 to 12.5% during 1991-1997. Eight years after the publication of the results, Parma campaign continues to be effective. In the period of 1999-2006, only 5 (15%) of newly diagnosed diabetic children from the province of Parma (n. 32) had a severe DKA. Today's data confirm that enuresis is an important warning symptom for the early diagnosis of type 1 diabetes. An extension of this anti-DKA initiative

could be considered the Telephone Hotline Service (THS), implemented in 2001 at the same University Hospital, in order to help the parents to manage their child's diabetes during an intercurrent disease without having to leave home. Thanks to THS, the admittance to hospital because of a DKA acute illness-related fell from an average of 10 cases per 100 children per year in the Nineties to 3 cases per 100 children per year in 2001-2006 period. The costs for admittance decreased of 60%. These two low-cost experiences, which effectively reduced the number of children needing emergency hospitalisation due to DKA, could be considered to be worldwide extended.

No conflict of interest

0443

Risks and preventive strategies in the Gulf region

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Diabetes and other non-communicable diseases (NCD) has become a major health concern for the six countries of the Gulf Cooperation Council (GCC). 5/6 and 3/6 of the GCC countries are among the top 10 in the prevalence of diabetes and impaired glucose tolerance respectively. The situation will remain the same by the year 2025. The prevalence of other risk factors for NCD such as obesity, inactivity, unhealthy eating habits, hypertension, dyslipidemia and smoking are also of alarming significance. Figures as high as 75% and 58% for obesity and inactivity were reported in a recent survey from Kuwait.
A 10 year strategic plan, endorsed by the highest political bodies in all GCC countries, was approved. In this plan seven goals have been identified:

1. Primary prevention of Type 2 diabetes
2. Secondary prevention of Type 2 diabetes
3. Improvement of the quality of service provided to people with diabetes
4. Empowerment of methods of evaluation and auditing the services provided
5. Conduction of research in the different areas of diabetes
6. Empowerment of patients and their families role in their management
7. Empowerment of the role of NGOs.

Each goal has its realistic and achievable targets, strategies, application tools and indicators of application tools.
This could be an important step towards fighting diabetes in the GCC countries, an area of high prevalence of diabetes and its associated risk factors, the outcome of which is awaited.

No conflict of interest

DEBATE

Are the highly academic clinical guidelines useful to the patient on the ground?

0444

Do the highly academic clinical guidelines make a difference to diabetes care delivery at ground level ? No

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Guidelines produced by institutions such as IDF, ADA, EASD, AACE, and even smaller institutions, make no difference concerning diabetes care delivery at the ground level, where treatment and care of the diabetics is provided by primary healthcare physicians.

1. **Are Guidelines available to most Primary Healthcare Physicians? No.**
   Most physicians are not acquainted with the guidelines, or have difficulties to access them.
2. **Are guidelines easy to reach? No.**
   All guidelines, including IDF's are copyright protected and cannot be reproduced. The internet is not a popular tool in developing countries, and the access to institutions are usually paid.
3. **Do primary healthcare delivery centers get recent orientations based on guidelines? No.**
   Information reaches them indirectly, much later. Professionals are usually not adequately trained, nor specialized.
4. **Are there specialists in the primary healthcare delivery? No.**
   Endocrinologists and diabetologists are minority groups who perform their work in tertiary clinics and hospitals. Some of them are not familiar with the guidelines. Other who are, do not necessarily apply them in practice.
5. **Do the Public Healthcare System apply the guidelines? No.**
   Knowledge is not spread. It is considered as a "specialty". "Continuous Medical Education" is unavailable. Most of the time is spent within a deficient and slow health service. Physicians are not sponsored nor encouraged to take updating courses.

Conclusion:
General guidelines embrace **2 worlds:**

1. The **Scientific World** for a minority of specialists who study, read publications, go to international congresses and are constantly updated.
2. The **Real World** where most physicians are, delivering actual treatment to the diabetics. 70 to 80% of the patients are treated by them. When they have complications they are referred to a specialized treatment.

No conflict of interest

0445

Yes: if implemented practically

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Aims: Several organizations worldwide have published and recommended clinical guidelines for the evaluation and management of persons with diabetes. Guidelines are based on scientific clinical evidence that points towards the prevention of chronic diabetic complications. The guidelines aim towards improved blood glucose control, an overall increase in quality of life, reduced sickness absence and reduced mortality. Financial benefits will follow directly from clinical benefits. Primary care may benefit through a reduction in the number of consultations and secondary care should benefit from a reduction in the number of hospital admissions for adverse events as a result of poor glycemic control. Clinical guidelines recommend the management of other cardiometabolic risks factors to reduce the morbidity and mortality associated with the highly prevalent atherosclerosis and cardiovascular disease present in people with diabetes. Academic clinical guidelines aim at the present and future well being of the patient. The aim of the presentation is to probe that highly academic clinical guidelines are useful to the patient on the ground if implemented practically.
Methods: Review of the literature
Results: Guidelines are written recommendations well thought by experts. A consensus is reached and recommendations are made. Guidelines are published for individuals, physicians and institutions to follow. Guidelines should be adopted and documentation provided on the outcomes of this implementation. Given that the guidelines are disseminated and followed, outcomes should be documented and published.
In order for patients to adhere to the guidelines, they should be widely distributed, easy to read and understand and relatively easy to follow. By taking these measures, patients should be able to stick to them. Implemented guidelines are expected to produce long lasting benefits.
Achieving the recommended levels of glycated haemoglobin and blood glucose levels are expected to have a sixty three percent reduction in retinopathy, fifty four percent reductions in nephropathy, sixty percent reduction in neuropathy and fourteen percent reduction in cardiovascular events.
Conclusions: Practical implementation of academic guidelines and attainment of targets will translate into less chronic complications, less expenses in health care, better nutrition, better productivity and better quality of life.

No conflict of interest

OPEN FORUM

LIVING WITH DIABETES

Living with diabetes and its complications: perspective of someone with diabetes

0446

Accepting diabetes

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Elliott Yamin has learned to manage his Type I diabetes and, as spokesperson for the American Diabetes Association, help others do the same.
In an exclusive interview, Yamin spoke with Parade.com's Caitlin O'Toole about his illness.

On Being Diagnosed With Diabetes

"I was diagnosed at a very young age. I was 15 going on 16. It was hard for me to adjust to treating my diabetes, but it was also hard to admit that I had it. I was in denial. That was a big hump for me to get over. I didn't understand how I could just go from being a normal kid to having this incurable lifelong disease in a matter of a day's time. I was very angry. I was very upset. I didn't know how to deal with it and I didn't want to tell people, I was embarrassed by it. And I certainly didn't want to seem like some charity case."

On 'Inspired by Diabetes'

"There's a competition called **Inspired by Diabetes**. It's a freedom of expression competition where diabetics can share their stories through art, through music, through paintings and so forth. They can win trips to Italy, they can win backstage passes and concert tickets to my shows, it's a really cool way for people to share their stories with everybody through art."
"It benefits another program called Life for a Child, which raises money for developing countries around the world where there are kids with diabetes that lack insulin and medical care. So we're also raising money to bring diabetics insulin who don't have insulin."

On Managing His Diabetes on Tour

"There are times during the day where I'm just relaxing and then I start getting dizzy and start getting anxious leading up to show time. All the anxiety that comes along with this gig affects my blood sugar. I just have to be more keen about how my body feels and check my blood sugar more often. Even so, I still get my highs and lows. But as long as I recognize the signs right away and correct them, I am fine."
"Quite frankly, I'm tired of taking insulin and pumping my stomach every three days and pricking my finger and drawing blood out of it every day – it's a tedious, meticulous, annoying disease that never goes away. And I want to get rid of it like everybody else does."

No conflict of interest

0447

Impaired kidney function

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[1] Brisbane, Australia

Living with Type 1 diabetes was manageable; part of my daily routine. Living with daily dialysis was an ordeal; limiting, demoralising and dominating every routine.
My 33 years of living with diabetes has included "field testing" most diabetes complications – diabetic retinopathy, mastopathy, autonomic neuropathy, peripheral neuropathy, coronary artery disease and nephropathy.
I am unable to give a control in my personal research, none were trialled in singularity.
Living with each complication was hard, resulting in further restrictions, treatments and lifestyle changes.
My kidneys progressed from showing signs of minor damage through impaired renal function, chronic kidney failure, 3 years of 10 hour daily home dialysis and ultimately a "combined simultaneous pancreas kidney transplant".
Medications and restrictions increased the further deterioration of my kidneys. An easy-to-stick-to low carbohydrate, low fat, low sugar diabetes diet advanced to a difficult renal diet - cutting out sodium and all but low potassium containing foods. The diet became extreme on dialysis, when phosphate intake was also controlled and fluids were limited to 500ml/day. I survived on protein bars and the 21 litres of glucose dialysate used to wash my blood each day. After a while I didn't mind the restrictive diet; I didn't want to eat at all.
Following a kidney pancreas transplant, I now have Type 4 diabetes – I am still living with the diabetes complications; I just no longer have Type 1 diabetes.
I traded dialysis, multiple daily injections and BGL monitoring for handfuls of immunosuppressants and the high risk of infection.
The only good treatment for kidney disease is prevention.

No conflict of interest

0448

Impaired sight

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At the age of 23, following 18 years of insulin-dependent diabetes, I developed diabetic retinopathy. As a result of macular oedema and vitreous haemorrhages, my vision deteriorated rapidly. Within the space of a few months, my visual impairment made it difficult for me to lead a normal life and I became reliant on the care of my parents. For a young person who had previously enjoyed a full and active life, this loss of independence had serious ramifications for my social and psychological wellbeing. Fortunately, due to careful monitoring and timely surgical intervention, my eyesight has been preserved and stabilised. I was lucky enough to be brought back from the brink of a potentially bleak future.
Reflecting back on my experience of impaired sight, I will draw out several issues which I feel need to be recognised and addressed. Diabetic complications, particularly reduced vision, can diminish the ability to manage one's life independently. People facing this need adequate support, both practical and emotional. Further, as a temporarily incapacitated person, I experienced some of the prejudiced attitudes that others can hold towards those with a perceived disability. Such barriers of misunderstanding and ignorance need to be broken down.
Ranging beyond this need to raise public awareness, my story also highlights several key messages for medical services. The emotional impact of diabetic complications must be recognised and matched with the provision of appropriate psychological support. Secondly, the necessity for routine, regular retinal screening at diabetic clinics and timely referral to ophthalmological services and targeted treatment is paramount. Finally, and perhaps most importantly, every practitioner involved in the care of children and young people with diabetes must take responsibility for educating and encouraging their patients to maintain good control, with a view to avoiding the potentially debilitating effects of diabetic complications.

No conflict of interest

0449

Impaired sleep

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Sleepiness and sleep loss, acute symptoms of glucose variation?
It is well known, and individuals complaints are frequent, that hypoglycemia as well as hyperglycemia can lead to sleepiness and impair night sleep. As we will discuss in this presentation, sleep impairment does not seem to be only an acute symptom of glucose variation, but also a consequence of poor glycemic control in individuals with both types of diabetes, affecting sleep and wakefulness. Moreover, sleep disorders have been shown to impair metabolic control. For this reason, sleep impairment and poor metabolic control should be understood as constituents of a vicious circle, where the deterioration of a component impacts and worsens the other as well. Furthermore, some already known links of this interaction will be discussed, including: sleep disordered breathing; activation of the sympathetic nervous system, leading to stimulation of the hypothalamic-pituitary-adrenal axis, resulting in hypersecretion of cortisol; insulin resistance; and impairment of appetite regulation.

No conflict of interest

SYMPOSIUM

CLINICAL RESEARCH

Novel therapies for glucose-lowering

0450

Therapeutic implications of SGLT2 (sodium glucose co-transporter 2) inhibition

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The kidney plays a major role in glucose homeostasis, not only producing but filtering glucose through the glomerulus and reabsorbing it in the proximal tubule. In non-diabetic individuals, the kidney filters and reabsorbs approximately 180 g glucose daily. Filtration occurs via passive diffusion and the amount of glucose filtered is proportional to its plasma concentration. Reabsorption of glucose occurs in the proximal tubule via sodium glucose cotransporters - SGLT1 and SGLT2. SGLT1 is found primarily in the intestines and kidneys, where it is responsible for ~ 10 % of renal glucose reabsorption. SGLT2 is found only in the S1 segment of the proximal tubule and accounts for ~ 90% of glucose reabsorption. In uncontrolled diabetes, the amount of filtered glucose is increased and can exceed the reabsorptive capacity of the SGLTs, resulting in variable amounts of glycosuria. Recently, compounds have been developed that specifically target SGLT2 and inhibit these transporters by 30-50% resulting in glycosuria. SGLT2 catalyzes the active transport of glucose uphill across the apical (luminal) proximal tubule membrane against a concentration gradient, by coupling it with the downhill transport of Na+. The inward Na+ gradient across the luminal epithelium is maintained by ATP-driven active extrusion of Na+ across the anti-luminal surface into blood. Glucose diffuses passively out of the cell down a concentration gradient via basolateral GLUT2 (and GLUT1) facilitative transporters.
When used in individuals with diabetes, SGLT2 inhibition can result in a lowering of both fasting and postprandial plasma glucose levels and weight loss due to calories lost as glucose. Through this unique mechanism, SGLT2 inhibitors may have therapeutic value in both type 1 and 2 diabetes as well as obesity. Several highly selective SGLT2 inhibitors are currently undergoing phase II and phase III clinical trials and appear to be safe, effective and well tolerated based on the short-term data.

Conflict of interest:
Advisory board: Robert Henry, MD: Bristol Myers Squibb/Astrazeneca, GlaxoSmithKline, Boehringer Ingelheim, Roche Pharmaceuticals, Isis Pharmaceuticals
Commercially-sponsored research: Robert Henry, MD: Bristol Myers Squibb/ Astrazeneca, GlaxoSmithKline

0451

Glucagon receptor antagonists

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Existing therapies targeting the treatment of hyperglycemia in patients with diabetes provide modest degrees of efficacy or are associated with liabilities such as excessive hypoglycemia and weight gain. Therefore, there is a continuing need for more effective and better tolerated approaches to diabetes treatment. Glucagon action has a critical role in the pathogenesis of hyperglycemia in both Type 1 and Type 2 diabetes, contributing to both fasting and postprandial hyperglycemia. Via the activation of a specific G-protein coupled receptor (GCGR) and subsequently increased cellular cAMP levels, glucagon drives hepatic glycogenolysis and gluconeogenesis. Further validation of GCGR antagonism as a possible therapeutic approach derives from several lines of evidence: GCGR null mice have improved glucose tolerance; inhibition of GCGR expression (***e.g.*** antisense oligonucleotides) ameliorates hyperglycemia in diabetic rodents; importantly, several structural classes of orally bioavailable small molecule GCGR antagonists are also efficacious in animal models of Type 2 diabetes. These data will be reviewed along with an assessment of the challenges associated with targeting GCGR antagonism as a possible means of achieving new therapies for diabetes.

Conflict of interest:
Stock ownership: D. Moller owns stock in Eli Lilly and Co.
Employee: D. Moller is an employee of Eli Lilly and Co.

0452

Assessing the potential of glucokinase activators (GKAs) in diabetes therapy

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The rationale and current status of using glucokinase activators (GKAs) for oral treatment of T2DM will be discussed. GKAs are small molecules (MW around 500) which were discovered about a decade ago in high through-put screening of a large library with a screening test involving human glucokinase (GK) inhibited by glucokinase regulatory protein (GKRP). GKAs increase GK's glucose affinity as much as tenfold and increase its kcat as much as twofold. They may lower the Hill coefficient of GK dose dependently as much as 40% but have practically no effect on MgATP affinity. Activation of GK has profound effects on glucose homeostasis in healthy common laboratory animals and in humans. It enhances glucose induced insulin release and potentiates the glucose dependent action of amino acids, fatty acids, acetylcholine and GLP-1 on insulin secretion. GKAs enhance glycogen synthesis and inhibit gluconeogenesis in the liver. GKAs are postulated to influence glucose dependent processes in other GK containing cells (e.g. hypothalamic neurons, entero-endocrine cells and pituitary gonadotropes). GKAs have been demonstrated to lower blood glucose in patients with T2DM dose dependently such that the diurnal glucose profiles were practically normalized at the highest dose. These pharmacological results in normal and diabetic subjects strongly support widely accepted views about the central role of GK in the maintenance of glucose homeostasis, that is as glucose sensor in the insulin producing pancreatic beta-cells and other GK containing glucose sensor cells, and as predominant regulator of hepatic glycolysis, glycogen metabolism and gluconeogenesis. The results also indicate that GK serves as viable drug receptor in patients with T2DM. It remains to be evaluated in clinical trials whether GKAs fulfil their promise for novel oral antidiabetic drugs with a unique mechanism of action and considerable potential for mono- and combination therapy.

No conflict of interest

0453

Novel PPARs

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The greatest clinical challenge in type 2 diabetes mellitus (T2DM) is the prevention of its long-term complications, many of which are of cardiovascular nature. Despite the progress in cardiovascular risk management of diabetic patients using lipid-lowering and anti-hypertensive drugs, a substantial residual risk persists. Indeed, treated diabetic patients experience a similar risk as untreated nondiabetic individuals. Although glycemic control through the use of antihyperglycemic agents improves microvascular complications, macrovascular disease risk is not reduced. These observations point to the need for additional therapeutic approaches in order to better control global cardiovascular risk. The PPAR family members play major roles in the regulation of lipid and glucose metabolism and immune-inflammatory processes, making these transcription factors ideal targets for such therapeutic strategies. This presentation will discuss our current knowledge of the effectiveness of PPAR-based therapeutics focussing on cardiovascular disease in T2DM, and the future prospects for novel generation PPAR agonists.

No conflict of interest

SYMPOSIUM

Diabetes and the brain

0454

Brain glucose and glycogen metabolism in diabetes and hypoglycaemia unawareness

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Hypoglycemia unawareness (HU), the condition where patients are unable to detect hypoglycemia until neuroglycopenia develops, is an important factor that limits the intensity with which glycemia can be managed. The underlying pathogenesis of HU remains uncertain, but compensatory changes in brain glucose metabolism that support cerebral energy metabolism have been hypothesized. Using 1H magnetic resonance spectroscopy (MRS) we previously demonstrated that patients with type 1 diabetes and HU have higher steady state brain glucose concentrations than controls at the same blood glucose levels. Subsequent studies in which 13C MRS was used to measure rates of cerebral glucose metabolism in controls and in patients with type 1 diabetes and HU suggested that an upregulation in glucose transport, as opposed to a reduction in glucose metabolism, may contribute to the development of HU. Changes in brain glycogen metabolism are also hypothesized to play a role in HU, although little has been known about its role in brain energy metabolism. To determine if brain glycogen could be mobilized during hypoglycemia, we measured the rate of label washout from [1-13C]glycogen in the brains of healthy humans during hypoglycemia. We found the rate was higher during hyperinsulinemic hypoglycemia than during hyperinsulinemic euglycemia (0.12 ± 0.05 vs. 0.03 ± 0.06 µmol/gm/hour, $p < 0.02$, $n = 5$). To determine if brain glycogen content is increased following an episode of hypoglycemia, we measured the levels of newly synthesized glycogen up to 80 hours after experimental hypoglycemia in healthy humans and found it was significantly higher than that measured after euglycemia ($p< 0.01$, $n = 5$). These observations suggest brain glycogen supports energy metabolism during hypoglycemia and that levels of glycogen may rebound to a higher than normal level following a period of reduced blood glucose. Subsequent experiments will determine if changes in brain glycogen metabolism contribute the development of HU.

No conflict of interest

0455

Hypoglycaemia: basic mechanisms for HAAF

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Hypoglycaemia, and the syndrome of hypoglycaemia-associated autonomic failure (HAAF), represent a significant complication and barrier to the use of intensive anti-hyperglycemia therapy in diabetic individuals. HAAF may occur as a result of impaired glucose-sensing mechanisms or impaired central nervous system (CNS) activation of neuroendocrine counterregulatory responses (CRR). Research from our laboratory suggests that both mechanisms may contribute to the impaired CRR, of which glucagon and the sympathoadrenal epinephrine responses are most critical. We have mapped the pattern of brain activation in response to single vs. multiple bouts of hypoglycemia and have observed that the medial hypothalamus shows decreased activation (c-Fos expression) with recurrent hypoglycemia. Further, expression of the alternative transcription factor FosB is increased in the medial hypothalamus, suggesting that there is both altered and re-programmed CNS activity with recurrent hypoglycemia. Our studies also show an important relationship between medial hypothalamic neurons and glia, as disruption of the specialized glial cells lining third ventricle impairs CRRs to hypoglycemia. The pattern of brain activation with hypoglycemia also implicates the involvement of brain stress circuitry which modulates activity of the medial hypothalamus. Our initial findings, as well as clinical observations that support this model, suggest the early onset of neuroplastic changes with the experience of a hypoglycemic event. Finally, studies implicating the involvement of CNS serotonergic neurons in both behavioral and neuroendocrine responses to hypoglycemia, and a protective effect of the serotonin-based antidepressant sertraline, will be reviewed and implications for therapeutic approaches to prevent or blunt hypoglycemia will be discussed.

No conflict of interest

0456

Insulin resistance and depression

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A nascent explanatory theory regarding the pathophysiology of major depressive disorder posits that alterations in metabolic networks (e.g. insulin and glucocorticoid signaling) mediate the allostatic load associated with this syndrome. Disturbances in metabolic networks: e.g. insulin-glucose homeostasis, immuno-inflammatory processes, adipokine synthesis and secretion, intra-cellular signaling cascades, and mitochondrial respiration are implicated in the pathophysiology, brain volumetric changes, symptomatic expression (e.g. neurocognitive decline), and medical comorbidity in depressive disorders. The central nervous system, like the pancreas, is a critical modulator of the metabolic milieu and is endangered by chronic abnormalities in metabolic processes. We propose the notion of "metabolic syndrome type II" as a neuropsychiatric syndrome in which alterations in metabolic networks are a defining pathophysiological component. A comprehensive management approach for depressive disorders should routinely include opportunistic screening and primary prevention strategies targeting metabolically mediated comorbidity (e.g. cardiovascular disease). Innovative treatments for mood disorders, which primarily target aberrant metabolic networks, may constitute a potentially novel, and disease-modifying, treatment avenue. This presentation will review the critical role that insulin plays in neurotrophism, neuroplasticity, and neuromodulation. Genuinely novel therapies for psychiatric disorders will be presented during this symposium.

Conflict of interest:
Paid lecturing: Research or Grants from Private Industries or Non-Profit FundsStanley Medical Research InstituteNational Alliance for Research on Schizophrenia and Depression (NARSAD)Pharmaceutical Income:Advisory Boards Astra ZenecaBristol-Myers SquibbFrance FoundationGlaxoSmithKline Janssen-OrthoSolvay/WyethEli LillyOrganonLundbeckBiovailPfizerShireScheri ng-PloughSpeakers BureausJanssen-OrthoAstra-ZenecaEli LillyLundbeckBiovail WyethCME ActivitiesAstra ZenecaBristol-Myers SquibbFrance Foundation I3CMESolvay/WyethPhysicians' Postgraduate PressCME outfitters Research GrantsEli LillyJanssen-OrthoShireTravel FundsNoneEquity OwnershipsNoneProfit Sharing AgreementsNoneRoyaltiesNonePatentsNone

SYMPOSIUM

HEALTHCARE AND EPIDEMIOLOGY

Secondary prevention programmes for prevention of complications

0457

Overview of prevention of complications

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Hyperglycaemia is a statistically independent and modifiable risk factor for both the microvascular and macrovascular complications of type 2 diabetes. Improving glucose levels has been shown in randomised controlled trials, such as ADVANCE and the UKPDS, to reduce microvascular risk substantially and to effect a modest reduction in cardiovascular risk, as confirmed by meta-analyses of the ACCORD, ADVANCE, UKPDS and VADT trials. In addition, the UKPDS post-trial follow-up data have shown that significantly reduced risks of both myocardial infarction and all-cause mortality are associated with earlier improved glucose control. In this third millennium, the epidemic of type 2 diabetes mellitus and the recognition that improved glycaemia can substantially reduce morbidity have made early and prolonged effective glucose control an essential requirement, in addition to the exemplary management of other proven interventions that reduce the risk of complications, such as blood pressure control, smoking cessation and optimization of lipid levels. Type 2 diabetes mellitus, however, is a progressive condition in which glycated hemoglobin (HbA1c) levels rise inexorably over time as beta cell function declines. Maintenance of near-normal glycaemia in order to minimise the risk of diabetic complications, particularly in the longer term, is difficult to achieve despite the use of multiple antidiabetic therapies. What is required is a comprehensive but flexible treatment strategy which, when instituted from

the time diabetes is diagnosed, can effectively manage the life cycle of the condition whilst ensuring maximum benefit for each individual.

No conflict of interest

0458

The importance of comprehensive diabetes management to prevent complications

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There is a substantial body of knowledge gained from clinical trials that a variety of interventions can prevent or retard the progression of complications. These include improved blood pressure control, improved glycaemic control and regular screening for eg retinopathy and foot pathology, with timely referral. Yet in the year 2009, the quality of diabetes care even in well resourced settings remains suboptimal, and complications with their resultant human and societal cost remain common. This highlights the complexity that constitutes effective diabetes care and the difficulty of translating evidence into practice beyond the individual. Considerable barriers to optimal management, care and thus outcome exist. These are to be found at three levels involving the health care system, health care personnel and the individual in his/her community. Health care delivery to prevent diabetic complications will of necessity require a comprehensive approach and programme to overcome the multi-levelled and multifaceted barriers. Such an approach requires a positive policy framework, provision of adequate numbers of well trained staff - skilled in both communication and clinical care, clinical guidelines that are appropriate to the setting, sufficient equipment for monitoring and screening, an uninterrupted supply of drugs as well as a process of enabling patients to take an active role in their own care. It is essential to ensure that regular monitoring and evaluation of the effectiveness of such a management programme is in place so that gaps and problem areas can be identified and acted upon.

No conflict of interest

0459

Cost-effectiveness of treatment for prevention of complications

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The overall purpose of economic evaluations of interventions for preventing diabetes complications is to lead toward policy development improving the efficiency of resource utilization. Most studies find improving glycaemia, blood pressure, lipids, and prevention oriented screening and care, not cost saving, but rather, most having favorable cost effectiveness. Over time, the use of more standardized methodology and reporting has improved study quality. However, in spite of this trend, quality remains highly variable. In addition, the ultimate goal for uptake into policy remains limited for several reasons including: poor understanding of the technical methods, use of simulations models, and interpretation of the results; generalizability into other settings, especially evaluations from high income countries translated for low and middle income countries; health system capacity and its ability to implement what was done (or something similar) in studies; single intervention studies while a package is needed for comprehensive policy; a dearth of short-term budget information for annual planning and implementation; and finally, competing policy goals that consider not only efficiency but also disparities and equity. In conclusion, while our understanding of the economics of diabetes interventions is improving, the ultimate goal of using this evidence for new policies is lagging.

No conflict of interest

0460

Implications of glycaemic control, therapeutic strategies and clinical practice guidelines

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Taken together, trials of glucose-lowering in diabetes show a marked reduction in both microvascular and macrovascular disease. With respect to cardiovascular disease, lowering of blood glucose appears to lower the risk of non-fatal MI, but does not prolong survival. Marked differences exist among trials regarding safety with respect to hypoglycemia, congestive heart failure and death, and differences by trial in therapies and strategies likely account for these observations. The results of trials, augmented by observational studies, provide the evidence for the development of guidelines.
The rationale for evidenced-based guidelines is that their use will achieve better health outcomes for patients, or better value for money, than would have been achieved otherwise. Guidelines for the care of patients with diabetes include both targets for glycemia and suggestions for specific therapies; the development of guidelines depends on epidemiologic, interventional and economic studies, often incorporating all three into disease models. Whereas placebo-controlled trials are required for drug licensing, diabetes guidelines depend on trials of active comparators, reflecting "real-life" clinical practice. Since the price of new drugs usually exceed those of older, off-patent drugs (yet may not be more effective), newer drugs generally must be associated with fewer side-effects. Guidelines may include recommendations based on whether they represent a good use of health care resources, acknowledging that diabetes is but one of many diseases for which payers direct health care resources.

No conflict of interest

SYMPOSIUM

LIVING WITH DIABETES

Gestational diabetes

0461

Critical issues for mother and child

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In regions where genetic predisposition for diabetes mellitus is high and where education, awareness and resources are low, critical issues for mother and child should be addressed in this context. Foetal, neonatal and maternal outcome will depend on screening for gestational diabetes mellitus (GDM), monitoring, treatment, time and mode of delivery, and neonatal care. Preconception screening of women with high risk factors should ideally be done. If diabetes is detected, pregnancy should be planned and optimisation of blood glucose, HbA1C and blood pressure should be done at least two months prior to conception. This reduces congenital malformations in the foetus.
If diabetes was not detected prior to conception, screening at first antenatal visit is compulsory. Repeat screening is performed at 24-28 weeks gestation to detect GDM. Method of screening could be a casual reading of blood glucose and confirmation by modified WHO-OGTT. SMBG with frequent dose adjustment should be encouraged. Ultrasound scans at 12 weeks and at 18–20 weeks are essential to detect foetal abnormalities. If required, scans should be repeated to monitor foetal growth.
Behavioural change and life style modification are essential. Insulin (short and intermediate acting) given in combination in two divided doses is more acceptable than four injections (3 short and one intermediate acting) in 24 hours. Oral hypoglycaemic agents e.g. glibenclamide, are a cost-effective and convenient alternative to insulin. With good blood glucose control, the aim should be to achieve time and mode of delivery similar to that of non-diabetic women. Neonatal care should be available and breast feeding encouraged. Post partum screening at 6–12 weeks is recommended to detect reversal of GDM and subsequent annual screening is advised. Since recurrence of GDM can result in early onset of overt diabetes, oral contraceptive advice with low oestrogen or progesterone-only pills should be given.

No conflict of interest

0462

Peri-natal management

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Gestational diabetes impacts on the mother and the baby during the pregnancy and after birth.

The definition of the perinatal period according to the WHO in 1992 is 'as commencing at 22 completed weeks (154days) of gestation (the time when birth weight is normally 500g) and ends seven completed days after birth'.
Diabetes is the most common medical condition in pregnancy. Despite optimizing metabolic control in the mother before pregnancy in pre pregnancy diabetes, and during the pregnancy for pre pregnancy and gestational diabetes, a range of birth defects are described. Diabetes affects 3-10% of pregnant women and causes 5.5 – 10% of congenital malformations. It also increases the rate of stillbirths and perinatal mortality by a factor of 4-5.
The perinatal period can be divided into three different periods. During the antenatal period congenital malformations appear and problems with growth become apparent. The time around the birth also gives rise to difficulties. This includes the gestational age (prematurity) at birth, size of the baby, the mode of delivery, and complications during delivery related to the size and delivery mode. Postnatal complications include hypoglycaemia, respiratory distress syndrome, hyperbilirubinaemia, polycythaemia, feeding problems and symptoms related to congenital malformations (e.g. cardiac malformations, gastroschisis).
The management of the baby depends on the complications that are encountered and will often require paediatric management either on the maternity ward if the symptoms are mild or a neonatal unit with specialist support. The specific management issues will be discussed.

No conflict of interest

0463

New treatment modalities

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Hyperglycaemia in Gestational diabetes mellitus (GDM) is directly associated with adverse pregnancy outcomes. Recognising and treating GDM results in lowering of maternal and foetal complications. Currently, the standard management for women with GDM consists of lifestyle interventions that incorporate Medical Nutrition Therapy (MNT) with planned physical activity for at least 30 minutes each day. Women who fail to achieve adequate glycaemic control through diet and exercise therapy are given insulin injections. During the last decade, much interest has been generated in the new treatment modalities in the management of gestational or preexisting diabetes mellitus. Use of insulin analogues and oral antihyperglycaemic drugs has been explored in GDM but the use of these recent drugs is still limited due to concerns about their safety in pregnancy. The evidence available to date suggests that the rapid-acting insulin analogues (lispro and aspart) do not have adverse maternal or foetal effects during pregnancy in women with diabetes. However, evidence about the use of long-acting insulin analogues during pregnancy is limited. Data from clinical trials, retrospective studies and the published clinical experience have not demonstrated an increased risk of neonatal hypoglycemia and other neonatal morbidities with glyburide or metformin and there is strong evidence for their effectiveness and safety in the management of GDM. The American Diabetes Association and the American College of Obstetricians and Gynecologists, have not yet approved the use of insulin analogues or oral antihyperglycaemic agents in the treatment of GDM, however, the reissued July 2008 NICE clinical guidelines of NHS, UK on 'Diabetes in Pregnancy' have revised recommendation on how to utilize insulin analogues or oral antihyperglycaemic agents in the treatment of GDM. This presentation will review the latest research and published outcome results and objectively assess the value of these exciting new drugs in the management of GDM.

No conflict of interest

0464

Postnatal prevention for mother and child

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Gestational diabetes (GDM) is a well recognized condition that will progress into T2DM. It is an illness that needs prevention and could have targeted preventive programmes.
Majority of females with GDM are unaware of the risk they carry in developing T2DM following GDM. Life style modification is a key factor in prevention of progression of GDM to T2DM. Proper dietary habits and regular physical exercise helps to prevent obesity thus prevent development of T2DM. Long term breast feeding reduces incidence of T2DM in mothers with a past history of GDM. Pharmacological interventions have shown promise although still in research stage. Strengthening long term post natal screening of GDM mothers for diabetes is very important for early detection and management of the condition.
Similarly offspring of GDM mothers have a higher chance of developing T2DM later in life. Their genetic predisposition is a key factor for this, but early growth contributes significantly. Even independent of genetic predisposition, prevalence of overweight/obesity, IGT, hyperinsulism and insulin resistance is higher among babies born to mothers with GDM. Similarly children with poor growth due to GDM, having an accelerated growth in postnatal period, have a higher risk of developing obesity and related metabolic complications later in life. Therefore the centile of birth weight should be honoured and allowed to grow along that rather than trying to achieve a higher growth rate.
Primary prevention of development of metabolic complications in later life is possible by having optimal foetal and postnatal environment. Therefore it is important to identify and optimally manage pregnant mothers with GDM. Prolonged breast feeding practices and scientific weaning practices will help in preventing childhood obesity and related metabolic complications. As most obese children remains obese adults, it is important to adopt proper behaviour practices to prevent childhood obesity.

No conflict of interest

SYMPOSIUM

HEALTHCARE AND EPIDEMIOLOGY

Introduction to IDF Diabetes Impact Studies

0465

Diabetes Impact Study results for Africa

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Background: The economic and social impact of type-2 diabetes has not been measured in most low- and middle-income countries, including countries in sub-Saharan Africa. These data are important in justifying improvements in access to medicines, education, and medical care.
Methods: The study was initiated in five countries namely Cameroon, Kenya, Mali, Tanzania and Republic of South Africa. After selecting study locations in each country, persons with diabetes (cases) were identified from the populations of medical facilities and, if they consented, interviewed using a standard schedule. The interview schedule included questions about health-related quality of life; recent utilization of medical care and traditional healers; barriers to access to care; out-of-pocket payments for medical care; sources of funds to pay for medical care; complications of diabetes; other chronic and acute medical problems; effects of ill health on the subject's participation in work and social activities; effects of subjects ill health on other family members (education, nutrition, ability to work); and diabetes care (drugs currently taking, glucose testing). Control subjects were persons without diabetes who were of the same age and sex and lived in the same neighborhoods as the cases. Controls were selected by asking each case to identify his or her five nearest neighbors of the same age and sex. Interviewers contacted these potential cases in random order until a qualified and willing respondent was obtained. Responses were validated and additional information about expenditures were obtained by reviewing institutional records. The incremental impacts of diabetes were measured by subtracting mean values for controls from mean values for cases. Ratios were also calculated.
Results: Between 1000 and 2000 interviews have been completed in each country. Data entry is almost complete. Results will be available in time for presentation.

No conflict of interest

0466

Diabetes impact study results for Kazakhstan

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Aims of study: to understand the economic impact of diabetes in Kazakhstan.
Methods: During the survey, 3 regions will select total 1500 cases and 1500 controls (each 50 with DM1 and 450 with DM2 and 500 control respectively).
Discussion: Kazakhstan – is a country with location in Central Asia and in Eastern Europe. Population: 15,399,437 (2009). The area with severe pollution, expensive transportation, tradition of nutrition, differences in illness is a problem for the health care. In the past a plentiful supply of health personnel with autocratic management allowed to solve problems of social equity and justice, despite its economic non-effectiveness. Pharmaceutical industry was not development. The most of important medicines are admitted from abroad and are very expensive.
The financial reforms allowed increasing the Health Care expenditures during the last 5 years. But disintegration of Management, unsatisfactory health statistic data are the main barriers for effectiveness results. For the effective management the introduction of State Information Database ("The National Diabetes Register") was perfomed. In 2008 the amount of DM patients - 153 000, 8% - DM Type 1. The prevalence of DM – 1 %. But survey in 1999-2000 demonstrated that 3,8 - 4,0% of population have known diabetes. The most of them were faced with difficulties in access to medical and social service. Despite fact that Direct Medical Cost for DM was increased for 2 times during the last 5 years (9,6 M EUR - 16, 3 M EUR), the IDF experts estimate the total diabetes cost for Kazakhstan as more than 300 M EUR or 10-19% from all health care budget.
Studying of real cost of a diabetes both for patients, and for public health services system are necessary for introduction of the optimal standards for treatments, preventive and social programs.

No conflict of interest

0467

Diabetes Impact Study results in 14 provinces in China

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Aims: Several studies have clearly demonstrated a rising trend in the prevalence of diabetes mellitus (DM) with increasing urbanization in the Chinese population. In 1994, we conducted a large epidemiological study involving 19 provinces in China and reported a 2.5% prevalence of DM in people aged 25-64 years. The prevalence of diabetes in China has increased rapidly in recent years. The purpose of the survey was to estimate the prevalence of diabetes.
Methods: Diabetes survey was a cross-sectional study from 14 provinces and municipalities in China. A standard 75 g oral glucose tolerance test (OGTT) was performed to define undiagnosed diabetes or Impaired Glucose Regulation (IGR) using 1999 WHO diagnostic criteria, while subjects with self-reported diabetes underwent a meal test.
Results: The crude prevalence of diabetes and IGR was about 10.0% and 15.0 %, respectively. After adjusting for other risk factors, men had an increased risk of diabetes, while subjects with a high level of education had a decreased risk of diabetes than those with a low education level. The prevalence of DM was 4-fold higher than that of the 1994 survey.
Conclusions: The current survey showed that the prevalence of diabetes and IGR has increased markedly in recent years in China, indicating that diabetes has become a major public health problem. Given the proven effectiveness of primary prevention of DM, our results call for an urgent establishment and implementation of a national diabetes prevention program to detect, prevent and provide early treatment for people with high risk.

No conflict of interest

0468

Diabetes Impact Study results for Argentina

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Background: Diabetes care quality is poor worldwide and outcomes do not reach international guidelines target values. We hypothesize that care quality depends on 1) healthcare providers knowledge and motivation; 2) patient accessibility to care and treatment, 3) patient active participation in disease control and treatment; 4) education is an efficient tool to improve it. Data from Argentina support this hypothesis: General Practitioners (GPs) Education Program: 900 Type 2 diabetes mellitus patients from 500 GPs were evaluated one year before and after attending interactive theoretical practical courses, showing significant improvement in: Procedures performance: Fundus oculi 52 vs. 86%; cardiovascular assessment 63 vs. 88%; SMBG 27 vs. 66%. Treatment prescriptions: physical activity 23 vs. 73%; metformin 31 vs. 40%; insulin 5 vs. 18%. Outcomes: BMI 29 ± 5 vs. 27 ± 5 kg/m^2; SBP 144 ± 22 vs. 124 ± 23 mm Hg; DBP 96 ± 22 vs. 80 ± 9 mm Hg; fasting blood glucose 210 ± 71 vs. 150 ± 40 mg/dL; A1c 9.8 ± 2 vs. 7.8 ± 1 %; total cholesterol 239 ± 79 vs. 207 ± 28 mg/dL; triglyceride 215 ± 92 vs. 165 ± 51 mg/dL; severe hypoglycemia episodes (frequency) 8.5 vs. 5.9 %; yearly hospitalizations 25 vs. 17 %. Integral Diabetes Care Program (PROPAT): Case-control study matching patients by age and gender implemented in a HMO of the Province of Buenos Aires. All recommended practices recorded at baseline increased significantly one year after PROPAT implementation, with a concomitant significant improvement in all clinical and biochemical parameters tested and a 28% decrease in total annual per capita costs (Diabetes Res Clin Pract 72:284, 2006).
Conclusions: Education improves the quality and the corresponding costs of diabetes care.

No conflict of interest

SYMPOSIUM

EDUCATION

Nutrition guidelines: challenges and solutions

0469

Carbohydrate counting: an effective tool or setting people up for failure?

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Dietary management is a difficult aspect of diabetes care. Therefore dietary advice should be individualised and interventions be evidence based. Historically carbohydrate counting (CC) was used to regulate intake, but advances in insulin treatment allow adjustment of rapid acting analogues to balance variable amounts of carbohydrate. Studies have used CC as an integral part of structured education, they involve knowledge and skills training in: estimating CC in either grams, or 10/15 gram portions; monitoring pre-prandial and often post-prandially blood glucose levels (BG); establishing the carbohydrate:insulin ratio; calculating correction doses of insulin; injecting calculated boluses of rapid acting insulin either before or after the meal, depending upon the carbohydrate estimation. This procedure needs to be performed 4 – 7 times daily - a very demanding and intensive regimen. However, CC is associated with better glycaemic control if counting is precise and in the context of BG excursions after food intake, CC does not need to be more precise than ±10 gms.
The complexity of this approach to management may not be suitable for more than a minority of highly motivated individuals. The DCCT used CC in the context of supportive relationships with the diabetes team, and the management was based on problem solving and goal setting. In isolation, without fully supportive and structured education, CC has not been shown to be effective. Thus, if care plans are not individualised and CC is part of an excessively demanding regimen, many people may be unable to cope. In addition people with diabetes are an extremely vulnerable group. Type 1 diabetes can increase family conflict/dysfunction and contribute to psychopathology such as depression and eating disorders. Therefore the style of dietary management should be carefully chosen

and continually supported to prevent detrimental side-effects such as feelings of failure and consequent reduction in quality of life.

No conflict of interest

0470

Controversies in nutrition therapy

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Lifestyle modification is universally accepted as the key to stemming the tide of the epidemics of obesity and Type 2 diabetes in high risk populations, and reducing the risk of progression to diabetes in individuals with prediabetic states. Appropriate nutrient intakes and regular physical activity are also cornerstones in the management of established diabetes. Lack of compliance has typically been the explanation for failing to achieve the full benefit of "lifestyle therapy". More recently a number of controversies regarding the dietary prescription for the treatment and prevention of diabetes have been highlighted and these have caused confusion in the minds of health care professionals and patients to the extent that adherence to dietary advice may be further reduced. The optimal macronutrient distribution of the diet, the role of dietary fibre and the extent to which knowledge of the glycaemic index of foods should inform food choice, have been some of the major topics of debate. Other issues which relate to nutritional advice for the population at large, such as nature of dietary fat and the extent to which dietary sugars may be safely incorporated into the diet, apply also to people with diabetes. This review will describe the controversial aspects of the nutritional management of diabetes, and will conclude that these are readily reconciled and should in no way detract from the potential of lifestyle therapy in the management of diabetes.

No conflict of interest

0471

Nutrition and diabetes: global challenges for children and parents

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This presentation focuses on the growing global challenge of childhood obesity and its effect on the long term health of children and their families, especially with the rise in Type 2 diabetes amongst children. It also touches upon the importance of education for families living with Type 1 diabetes, in terms of carbohydrate management (amount and type) and the adjustment of insulin.
The WHO states that childhood obesity is one of the most serious public health challenges of the 21st century. In 2007, an estimated 22 million children under the age of 5 years were overweight throughout the world. More than 75% of overweight and obese children live in low- and middle-income countries so this is not just a problem for the developed world.
The IDF announced last year that, in the US, Type 2 diabetes represents between 8 and 45% of new-onset diabetes cases in children; that Type 2 is more common in children in Japan than Type 1 and; in native and aboriginal children in North America and Australia, Type 2 prevalence is as high as 5.3% (Source: Diabetes Atlas 3rd Ed, IDF, 2006). Diabetes Care published an Australian study in 2006 that showed young people with Type 2 diabetes had significantly higher rates of microalbuminuria and hypertension, despite a shorter duration of diabetes and lower HbA1c. (Eppens et al.; Prevalence of diabetes complications in adolescents with Type 2 compared with Type 1 diabetes. Diabetes Care 2006; 29; 1300-6)
The presentation will focus on various interventions, both local and national, to curb the rise in childhood obesity, and hopefully Type 2 diabetes, and to support those children and young people who have already developed either Type 1 or 2 diabetes to improve their long term health outcomes.

No conflict of interest

SYMPOSIUM

FOUNDATION SCIENCE

Generation of islet ß-cells from stem cells

0472

Understanding ß-cell development: the departure point for the generation of new ß-cells

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Beta cell failure causes diabetes and is currently treated by insulin replacement. Absolute or relative beta cell deficiency characterize diabetes type 1 (T1D, autoimmune) and T2D (life style induced), respectively. Diabetes associated late complications are devastating to T1D and T2D patients, and are caused by inadequate insulin replacement therapy (as measured by elevated HbA1c).
Beta-cell replacement therapy of T1D (organ donor islet transplantation combined with immunotherapy) can normalize HbA1c without insulin injections – and protect against development/escalation of late complications as long as sufficient numbers of functional beta cells survive in the graft.
Stem cells provide a realistic alternative source of therapeutic beta-cells, and directed differentiation of pluripotent embryonic stem cells towards pancreatic cell fates – including the insulin-producing beta cells – is in progress.
Robust protocols are yet to be defined that will coax different sources of pluripotent stem cells (ES cells and iPS cells) towards identical cell types.
Other useful stem cell stages may exist during the ontogenic path of the developing pancreatic beta cell – or even in the adult (diabetic) pancreas – that might be activatable to induce regeneration.
The use of pluripotent stem cells provides unique future opportunities in diabetes therapy/cure/prevention and will be reviewed.

Conflict of interest:
Paid lecturing: Ole D. Madsen
Stock ownership: Novo Nordisk A/S
Employee: Hagedorn Research Institute is owned by Novo Nordisk A/S
Commercially-sponsored research: Novo Nordisk sponsor a research collaboration with Cellartis and University of Lund in directed differentiation of stem cells towards beta cells.

0473

Mechanisms of human ß-cell expansion

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Although the pancreatic beta-cell mass can increase in response to metabolic demands, the mechanisms of this expansion in the human pancreas remain poorly understood. Based on rodent experiments, it is known that beta cells preferentially expand through proliferation, but neogenesis (differentiation from precursor cells) also contributes. It appears that in the human pancreas, both types of mechanisms are operative, but proliferation may be less important than in the rodents. Understanding of the mechanisms controlling beta-cell expansion in the human is of great importance for the development of novel therapies for all types of diabetes. Various in vitro models have been developed to address this issue. We have recently described the molecular composition of the human islet basement membrane which embraces the beta cells. We have then studied the impact of components of the physiological microenvironment for human beta-cell proliferation and differentiation. The results show that proliferation of adult beta cells, which is otherwise negligible, can be recorded when the beta cells are in contact with the laminin isoform which is found in the human islets (laminin 511). When cultured in the absence of contacts with the correct type of extracellular matrix, human beta cells rapidly undergo epithelial-mesenchymal transition and dedifferentiate into a proliferative mesenchymal-like cell. This dedifferentiation can be completely blocked by laminin 511. Likewise, our results show that laminins play an important role in the in vitro differentiation of beta cells from pancreatic duct cells. These results may prove useful for the development of methods for the expansion of human beta cells for cell therapy of diabetes.

No conflict of interest

0474

Functional beta cells from hESCs

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Embryonic stem (ES) cells are unique among stem cell populations, set apart by their extensive proliferative capacity and extremely broad differentiation repertoire. These two properties make ES cells an attractive source for production of differentiated and mature cell types useful in cell therapies for many degenerative diseases. However, substantial scientific challenges exist when employing ES cells, because differentiation to a discrete population of mature cells must first be developed before any realization of a therapy, or for development of cell-specific high-throughput screening assays. Successful strategies to harness the differentiation potential of ES cells must follow developmental biology principle to guide them sequentially and synchronously through progenitor cell intermediates en route to more mature cells. Through a step-wise differentiation protocol modeled after pancreatic development, we have generated pancreatic endoderm progenitor cells from human embryonic stem cells. Implantation of the hES cell-derived pancreatic progenitors into mice results in the efficient generation of glucose-responsive endocrine cells. Glucose stimulation in grafted mice produces insulin and C-peptide in the sera and at levels comparable to that of mice transplanted with 3000 human islets. Moreover, the insulin-expressing cells generated after implantation exhibit many properties that are characteristic of functional beta cells, including expression of critical beta cell transcription factors such as PDX1, NKX6-1, and MAFA, appropriate processing of proinsulin, and the presence of mature endocrine secretory granules. Finally, as a critical test of their therapeutic potential, we demonstrate that the hES cell-derived pancreatic islet tissue protects against streptozotocin-induced hyperglycemia. Glucose-responsive islet cells are capable of maintaining stable blood glucose levels in mice graffed for more than one year. Together, these data provide definitive evidence that hES cells are competent to generate glucose-responsive, insulin-secreting cells with characteristics similar to human islets and validates the use of hES cells for the production of a renewable human islet source.

No conflict of interest

0475

Multipotent stromal cells from human bone marrow (MSCs) to repair ß-cells in vivo

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We first reported (Lee, Seo et al. 2006) that the signs and symptoms of streptozotocin (STZ)-induced diabetes in NOD/scid mice were partially rescued by systemic administration of the adult stem/progenitor cells from human bone marrow referred to as mesenchymal stem cells, multipotent mesenchymal stromal cells, or hMSCs. The hMSCs decreased blood glucose levels and increased serum levels of mouse insulin without any increase in human insulin. There was also a slight decrease in mesangial thickening of glomeruli. A small number of the human cells engrafted into both pancreatic islets and glomeruli, but there was little evidence of differentiation of the cells. The observations were subsequently confirmed and extended by reports from three other laboratories that used rodent MSCs in immunocompetent rodents with STZ-induced diabetes (Dong, Chen et al. 2008; Ezquer, Ezquer et al. 2008; Boumaza, Srinivasan et al. 2009). To examine how the hMSCs produced their beneficial effects, we recently co-cultured the cells with mouse islets that were treated with STZ. In the presence of the hMSCs, there was an increase in proliferation of the islet cells and a decrease in apoptosis as assayed by TUNEL. We are currently testing the possibilities that the results can be explained by our recent observations in two other systems: (a) Intravenously administered hMSCs improved the hearts of mice with permanent ligation of the left anterior descending coronary artery because the cells were trapped as microemboli in the lung where they were activated to express the anti-inflammatory protein TSG-6 (Lee et al., Cell Stem Cell, in press). (b) hMSCs suppressed apoptosis in co-cultures with apoptotic lung epithelial cells by the hMSCs being activated to express the calcium regulating protein stanniocalcin-1 (Block, et al., Stem Cells 2009;27:670-81).

No conflict of interest

SYMPOSIUM

ASSOCIATION DEVELOPMENT

State of diabetes associations around the world

0476

Diabetes in different countries: different solutions, different associations ?

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The various stages in the diagnosis and treatment of diabetes are faced in many different ways in the countries around the world and two types of institutions were created.
The scientific ones, with professional members of the health areas and others, the so-called lay societies, with diabetic patients or relatives with diabetics in their families, interested in some non medical problems of the disease.
Both can work as individual institutions or, as it happens in many countries, only one society exists, exchanging ideas and effects in order to cover all the areas to reach a better life for diabetic patients.
In Latin America the first institution was created in 1951 in Uruguay, by the Sociedad Uruguaya de Diabetes (Asociación de Diabéticos del Uruguay), with a diabetic doctor in medicine Roca as President and Engineer Mr. Copetti as Vicepresident.
Few years later in August 24, 1954, in Argentina, a scientific society SAD (Sociedad Argentina de Diabetes), was founded by a group of professors of the University of Buenos Aires, clinicians with Dr. Pedro B. Landabure and a basic research doctor of physiology, Virgilio G. Foglia. Professor Landabure was the first president and Professors Pedro Escudero and Bernardo A. Houssay were appointed as Honorary National Members.
In 1956 the creation of a Lay society of Diabetes was considered and on December 1st. 1964, LAPDI (Liga Argentina de Protección al Diabético) was founded, the statutes approved by SAD with President Captain Luis B. S. Perazzo, Vicepresident Architect Antonio J. Varela and Secretary Dr. Mario Calvagno.
These two societies, SAD and LAPDI, had a very close and good colaboration in the organization of the 7th. International Congress of IDF, Buenos Aires, Argentina, August 1970.
Some other lay institutions were created afterwards, in order to improve the care of diabetic patients.

No conflict of interest

0477

The state of diabetes in Poland

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In Poland, there are over 2.5 million diagnosed cases of diabetes and about as many undiagnosed. Direct cost of diabetes is about 655 million euros (over 8% of the total healthcare spending). However, indirect costs, such as early pensions, absence from work etc. are much higher.
For a long time, Poland was one of the countries that placed the lowest in Europe in various diabetes care rankings, mostly due to the fact that insulin pumps and long-lasting insulin analogues were not reimbursed. While for the last 15 years there have been no problems with the access to glucometers, strips, pens, and needles, it is only this year that after many years of struggle, insulin analogues have finally become reimbursed and insulin pumps and accessories have become free for children and youth under 18 years of age.
One of the main problems in Poland is the lack of education of both patients and doctors. Also, there are no professional educators. A major consequence of this is foot amputations, which amount to 14 500 every year. Other diabetes complications are also very common, for example retinopathy, nephropathy, hypertension, and cardio-vascular diseases.
Moreover, diabetes to many is still a social problem. It happens fairly often that people conceal the fact that they have diabetes from their friends and especially from their employers. Fear of losing one's job because of diabetes is not rare, and unemployment among diabetics is a problem. Attempts are being made to activate those who are unemployed and socially excluded.

No conflict of interest

0478

Improving diabetes care in the Caribbean: how do we go about this?

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The World Health Organisation (WHO) describes diabetes as a chronic, debilitating and costly disease that poses severe risks for families, countries and the entire world. WHO further states that diabetes can be traced to overweight, obesity and physical inactivity and can be prevented through increased activity and a healthy diet.
Regionally, diabetes prevalence ranges from 18% in Jamaica to 8% in St. Lucia with lower extremity amputations in Barbados being among the highest in the world. It has been posited that by the year 2010, prevalence in the Caribbean will reach 25% of the adult population.
In 2003, the Caribbean Heads of Government mandated the establishment of the Caribbean Commission on Health and Development and in 2007 they met at the Regional Summit on Chronic Non-Communicable Diseases (CNCDs) and established a collective agreement to stop the epidemic of CNCDs entitled the Declaration of Port-of-Spain: Uniting to Stop the Epidemic of Chronic NCDs.
Where do we go from here?
As a Region – Fulfil the action promised by CARICOM and implement major aspects of the Port-of-Spain Declaration i.e., re-introduction of physical education in schools; provision of incentives and resources to provide healthy school meals and promote healthy eating in children; promotion of policies and actions aimed at increasing physical activity in the entire population and increasing public facilities to encourage physical activity by the widest cross-section of our citizens.
As Individual Countries – Reduce the costs related to the management of diabetes e.g. supplies and medication. Establish the post of diabetes educator specialist in our hospitals and clinics.
As Diabetes Associations – Promote behavioural change and improved self-management through education.
As individuals – Take steps to prevent or delay the onset of diabetes and its complications.
Awareness of diabetes is not the problem; it's time to motivate action.

No conflict of interest

0479

Diabetes associations in Africa: overcoming the barriers

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There are four diabetes associations in South Africa namely; the Diabetes Association of South Africa (SADA), the Society for Endocrinology, Metabolism and Diabetes of South Africa (SEMDSA), the Paediatric and Adolescent Endocrine and Diabetes Society of South Africa and the Diabetes Education Society of South Africa (DESSA). These organisations are affiliated and share a common goal of improving diabetes care in South Africa.
SADA is a national welfare organisation which provides support and information to people living with diabetes and to the public. It is run by the lay public but enjoys broad membership. SEMDSA, PAEDS-SA and DESSA are scientific bodies. Membership consists of health care professionals. This talk will review the function of these organisations and their roles in overcoming the barriers to comprehensive diabetes care.
SEMDSA is the parent body and was established in 1962 with the objectives of furthering scientific study and clinical practice and to promote clinical research in all branches of endocrinology, metabolism and diabetes. Over the years this role has evolved to include the development of education programmes and overseeing post-graduate training in the field of endocrinology. The establishment of the affiliated societies DESSA and PAEDS-SA arose out of specific needs identified. These organisations face on-going challenges in a complex health care system which consists of both public and private sectors.

No conflict of interest

WORKSHOP

Twinning: a way forward for association development ?

0480

Is "twinning" the way forward for smaller European associations?

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Aims: To introduce experience of the Lithuanian Diabetes Association what is achievable through twinning, and to encourage diabetes associations to initiate a twinning in their own countries.
Methods: Establishing the partnership, setting achievable objectives, evaluation of benefits.
Results: Main aims for diabetes associations are to seek a better and longer life for people living with diabetes and to help health-care professionals develop their own diabetes skills. Once an association has established that forming a twinning partnership would be of benefit, it needs to decide its aims and objectives. With well defined, achievable objectives, any association can be confident in the knowledge that those engaged in the twinning process are committed to a specific goal consistent with its own objectives. As a consequence, the twinning exercise will be more focused and manageable. Then it is time to make personal contact between the potential twin associations. It is usual for the association seeking a twin to make the initial approach to the association it wishes to twin with. Both partners should look seriously at their resources and needs to make sure that developing a relationship will be helpful. Priorities established by the twinning partners to improve the diabetes care situation in Lithuania 1992-1997 included: Postgraduate education. Danish hospitals agreed to educate a small group of Lithuanian doctors and nurses. Support for the production of the Lithuanian diabetes magazine. Provision of insulin and other diabetes equipment for children under 15 and pregnant women. The drafting of a national diabetes plan with help from a Danish expert. The establishment of outpatient clinics.
Conclusion: The twinning programe has been mutually beneficial. It has helped the Lithuanian Diabetes Association to function more efficiently on behalf of people living with diabetes and has generally strengthened the organization. The government has been continue to invest in diabetes care.

No conflict of interest

0481

Inequities in diabetes care in Africa: is twinning the way forward?

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Background: People with type 2 diabetes are increasing globally. Consequently, the diabetes-associated morbidity and mortality will rise significantly amid challenges of care.
Worldwide various regions exhibit disparities amongst populations, in resources, priorities and governance. This is replicated in diabetes care. There is need, therefore, to develop strategies within healthcare providers to interact and network with nations to accommodate less endowed regions to support scarcity of resources to improve care `of persons living with diabetes.
Twinning or symbiotic partnership is an appropriate strategy within and between countries to improve care of patients living with diabetes. Operationalizing twinning or partnerships within countries involves large institutions endowed with resources, skilled manpower and care facilities forming partnership with the smaller health units to enhance diabetes care. Likewise, countries with higher resource bases can partner at institutional levels (with hospitals, in operations research, staff development and training institutions) to establish and enhance capacities for diabetes care.
The partnerships can be achieved through exchange of personnel, technical support, technology transfer, telemedicine, collaborative research and broader educational activities. Anticipated constraints include unconstructive partnerships, disparities in socio-cultural factors, prioritizing levels of need; intricacies in co-financing; inadequate skilled personnel; poor infrastructure; bilateral uncertainties amid diminished latitudes in decision-making; negative attitudes from poor outcomes in less endowed institutions. These partnerships often lack guidelines to engage, how to monitor and evaluate the programs, consistency and sustainability or change of objectives downstream.

Established institutions like IDF should play a key role in facilitating partnerships amongst interest groups of member states, by providing a forum that develops global policy guidelines in twinning for diabetes care through different mediums.

No conflict of interest

WORKSHOP

Twinning and the Mozambique experience

0482

The twinning initiative in Mozambique: a model for improving diabetes care in resource poor settings

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Mozambique is located on the East coast of Africa and faces a large burden of Communicable Diseases, but Non Communicable Diseases such as diabetes are increasing. The Ministry of Health (MISAU) estimates the prevalence of diabetes at 3.4% with increasing rates of overweight and obesity especially in urban areas.
In 2003 the International Insulin Foundation (IIF) in collaboration with MISAU implemented the Rapid Assessment Protocol for Insulin Access (RAPIA). The RAPIA provided an analysis of the barriers to care for people with diabetes in addition to increasing the overall data available about diabetes in Mozambique. Following this assessment the IIF provided technical support to Mozambique. In 2006 a delegation from Diabetes UK visited Mozambique to see if a "Twinning Project" could be possible. Following this visit in 2007 the Diabetes UK-Mozambique Twinning Project was launched with a series of objectives that built on the RAPIA assessment, took into account local priorities and Diabetes UK's capacity.
Results from this Twinning have been the development of a comprehensive diabetes and Non Communicable Disease policy and Diabetes UK's support assists in the implementation of this plan. Through the training of healthcare workers, support to the different branches of the diabetes association and support for World Diabetes Day, Diabetes UK is helping improve care, increase awareness and promote prevention of diabetes in Mozambique.
From this experience a series of lessons learnt could assist other countries in developing similar programmes.

1. Base activities on a clear situation analysis and understanding of the local situation and needs
2. Develop relationships with local partners
3. Adapt objectives of project to local and external partner's aims
4. Flexibility
5. Develop North-South and South-South Links
6. Objectives should address different aspects of diabetes (e.g. policy, healthcare worker training, patient education, World Diabetes Day activities, etc.)

No conflict of interest

0483

Effective implementation of the co-operation

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The Mozambican Diabetes Association (AMODIA) was established in 1995 and has gone through three distinct development phases.
1995-2003: Creation and legal registration of AMODIA. The association did not have its own facilities, its activities were limited to a consultation as care for diabetes within the National Health Service was characterised by long waiting times and a chronic shortage of medicines with high prices for these.
2003-2006: The association's development, during this period, coincided with the creation of the Non Communicable Disease (NCD) department within the Ministry of Health, leading to an agreement between the Ministry and AMODIA for providing care to patients. AMODIA also received support from the World Diabetes Foundation, which helped establish two new branches of the association.
2007-present: A delegation from Diabetes UK visited Mozambique in 2006 with the objective of exploring the possibility to establish a "Twinning" project between Mozambique and Diabetes UK.
This "Twinning" project was finalised in 2007 with the following objectives:

1. Support healthcare worker training
2. Support specialised training.
3. Study visit from Mozambican Ministry of Health to the UK
4. Development of patient education materials
5. Organisation of World Diabetes Day
6. Advocacy and policy support for Ministry of Health
7. Development of a core group of people involved in diabetes
8. Development of AMODIA
9. Long term research programmes in Mozambique

All Provinces now have a team of trained healthcare (total 247 healthcare workers) workers in diabetes management. In addition 2 healthcare workers trained in Tanzania on diabetes education.
10 patients have been trained as diabetes educators and held education sessions in the community using locally developed materials. 3 branches of AMODIA now exist and follow a total of 3,600 people with diabetes (increase from 1,200 in 2006).
World Diabetes Day events were organised in 2007 and 2008, which helped raise awareness of diabetes directly in the community.
The National Plan for NCDs has now been finalised and NCD focal points have been nominated in 6 out of 10 Provinces.
A research project following a cohort of people with diabetes in Maputo has been initiated in collaboration with the University of Kwa Zulu Natal.
Besides these concrete results with direct impact on diabetes, this project helped reinforce the National Health Service. This "Twinning" was also based on both partners being in accord with regards to the defined priorities and the implementation of the planned activities.

No conflict of interest

OPEN FORUM

LIVING WITH DIABETES

Discrimination and diabetes

0484

Home and siblings

S. Murray[1]
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Diabetes is a chronic life-long condition that impacts upon almost every aspect of life. Living with diabetes is not easy. Medication is usually self-administered, whilst lifestyle changes involving diet and physical activity require commitment and active involvement.
Those with Type 1 diabetes have to balance the risks of hypoglycaemia against the longer-term risks of hyperglycaemia. Those with Type 2 diabetes usually need to make changes in their lifestyle, but this can be difficult to do if the individual does not feel ill or the impact of not doing so does not have immediate repercussions.
Diabetes is still one of those medical conditions in which discrimination may impact on the individual who has the disease. Many communities may direct unfavourable attitudes, beliefs, and policies toward people who have diabetes including their loved ones, family members, and / or close associates.
Ignorance and fear are the main causes of discrimination. However cultural beliefs may also play a role. In some societies diabetes is hidden because it prevents them and their siblings getting married.
Families too, of course, can suffer loss of earnings as a result of diabetes and its consequences A number of diabetes patients may not be able to continue working or work as effectively as they could before the onset of their condition and this can cause resentment within the family. Siblings have to learn to make adjustments when a brother or sister is diagnosed. They sometimes resent the attention given to the child with diabetes

No conflict of interest

0485

Marriage and society

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In spite of the rising level of education and increasing awareness of the disease diabetes continues to be an important social stigma in India, particularly for girls, as it is very complex and operates at many levels. It has both social and psychological aspects and has a serious impact on the health of the individual due to the inaccessibility to the existing Diabetes Care services.
Being born a girl in India is not easy, and if she has diabetes the parents try to hide their daughter's condition from the teachers, friends and relatives. Many parents perceive a girl with diabetes as a burden, difficult to marry off, unable to bear children and best ' disposed of'. This is common even among the educated class. Due to stopping of insulin or giving sub-optimal dosage, many of these young girls have poor glycemic control, frequent genito-urinary and skin infections and tuberculosis.
Our study shows that out of 546 type 1 DM subjects(M364, F182) with an average follow up of 15 years, only 46 girls remained with us out of which 12 completed high school and 8 completed graduation and only 5 got married. While 280 boys are still following with us, 225 graduated and gainfully employed, 62 married.
In Indian societies, marriages are arranged according to the casts, subcasts and family backgrounds. 'Kundali' (horoscope based on birth time and place) play a pivotal role. Although it has a great scientific basis both in terms of compatibility and well being of the couple it is rarely ever practiced accurately. It is not surprising to find a wealthy type 1 DM boy married to a healthy young girl from a poor family without disclosure of either his disease or early complications. Incompatibility is very high following such marriages.

No conflict of interest

0486

School and sports

A. Chapman[1]
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As a 'hidden' disease, people with Diabetes often encounter some of the most entrenched forms of discrimination - and most of the time the discrimination itself is hidden.
As a young person with Type-1 Diabetes, who was diagnosed at the age of three, I can look back on my life through school and through my professional sporting career and clearly see forms of discrimination that I could not identify were apparent at the time.
Prevention from participating in regular school life, school activities, sporting activities and even representative sports because of inherent discrimination, the only solution to these problems is proper education and awareness.
The presentation will look at my life's examples of discrimination as a young person, a teenager and a young adult. It will go into more detail investigating the variation between different approaches to care for young people with diabetes in schools and sports, as well as legislation apparent in Australia and around the world to protect against discrimination. It will also investigate the shifting paradigms of locating support - from the tradition support methods and structures to a 'new-age' of e-support and the effect of this on young people with diabetes.
Lastly, a recommended model, based on legislation and fairness, will be proposed - with the aim of reducing barriers and unfair social exclusion of people with Diabetes from school activities and sports.

No conflict of interest

0487

Workplaces

D. Cairns[1]
[1] London, United Kingdom

In 1989 I lost my boyhood dreams to fly jets in the British Royal Air Force when diagnosed with type 1 diabetes.
Around the world there are whole ranges of restrictions that can be encountered for people with diabetes, not just for flying careers, but in everyday workplace environments. In the UK, we are protected by government rules – a Disability Discrimination Act – that protects people from being barred from workplace jobs. In other countries people may not be so fortunate.
In 2000 I was able to return to my boyhood dreams to fly, thanks to a system in the USA that allows people with type 1 diabetes to fly on a full, unrestricted private flying licence. In 2003 a round-the-world flight (www.diabetesworldflight.com) brought me into contact with a wide range of people across 22 countries, some of whom experienced discrimination at normal workplaces. It was an eye-opening experience.
A commercial flying career remains no more than a dream for people with diabetes due to blanket ban policies by aviation authorities around the world at this time. The advent of new diabetes management technologies, including continuous glucose monitoring, may help change this situation. And hopefully work by groups such as www.pilotswithdiabetes.com can help change approaches to blanket ban policies for people with diabetes.
During my session I will highlight the current known situation for a number of career activities that remain restricted by blanket ban policies, and what is being done to try to change this situation.

No conflict of interest

SPEAKERS' CORNER

Hypoglycaemia - causes and solutions

0488

Hypoglycaemia - causes and solutions

F.G. Bowling[1], A.E. Stocks[2]
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Hypoglycaemia, low blood glucose, was defined in 1938. This definition is no longer adequate for our understanding of this risky and disabling consequence of diabetes. The failure to ensure an adequate supply of glucose to the brain, particularly when due to insulin therapy, means inadequate fuel for brain activity. Our research suggests that abnormal signalling molecules accumulate. These molecules explain the impairment in thinking, personality changes, and seizure activity.
There is considerable variation in how and when our brains respond to low glucose. This makes it difficult to define hypoglycaemia – how low is low? Individual variation depends on our genetics of glucose transport to the brain, whether we have alternative energy sources available, and to what extent our brain signalling molecules are disrupted.
The brain, rather than the blood, is the best target for the detection of hypoglycaemia risk. Blood monitoring has significant limitations in reliability and accuracy and cannot account for differences between individuals. Because we do not fully understand the molecular basis of hypoglycaemia, we cannot yet answer the decreasing awareness that occurs over time.
Innovative strategies for hypoglycaemia detection are focusing on the brain dysfunction and on the abnormal molecules that are generated, rather than unreliable blood measurements.
In a large study of 400 people with diabetes we found that pet dogs could detect the molecules associated with hypoglycaemia and then alert their owners. We are characterising the molecules to understand the underlying mechanisms, and to provide dog trainers with the substances needed to teach our pets to respond.
Other groups are attempting to monitor the brain impairment. Devices mounted into spectacles are being tested for driver awareness. Games in cell phones can also be used. Loss of hypoglycaemia awareness is one of the greatest challenges facing people with diabetes as we age.

No conflict of interest

THURSDAY 22 OCTOBER

SYMPOSIUM

CLINICAL RESEARCH

Non-type 1 diabetes in children

0489

Non-type 1 diabetes in youth: the rise and fall of the accelerator hypothesis

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The most common forms of diabetes in children are traditionally divided into Type 1 and Type 2 Diabetes. Type 1 Diabetes is generally viewed exclusively as an autoimmune disease, associated with high risk HLA antigens, early detection of islet cell autoantibodies, and ultimate demise of the b-cell, with insulin secretion near complete deficiency at the time of clinical presentation. Type 2 Diabetes can not be considered exclusively from the angle of the b-cells, but rather the interaction between insulin secretion and multiple physiological loops that control energy disposal, storage, obesity and insulin resistance.
The accelerator hypothesis first suggested in 2001, postulates that Type 1 and Type 2 Diabetes are not discrete but part of a spectrum of disease caused by three main accelerators. The first accelerator is the intrinsic/constitutional potential for a high rate of b-cell apoptosis, a necessary but insufficient step in the development of diabetes. The second accelerator is insulin resistance, resulting typically from obesity and a sedentary lifestyle. Insulin resistance appears to be the hypothesis linchpin for Type 1 and Type 2 diabetes. The third accelerator, immune damage, is found in a small subset of patients with both intrinsic lesion and insulin resistance who develop b-cell autoimmunity accelerating b-cell loss and expressions of autoimmune Type 1 Diabetes. The lack, however, of clear metabolic evaluations in children to distinguish between the two forms of diabetes leaves open the issue of overlapping forms of diabetes and the testing of the hypothesis. In this lecture data will be presented, using clamp experiments, to demonstrate important differences in ***in vivo*** insulin sensitivity and secretion in children with obesity and evidence of autoimmune diabetes (akin to latent autoimmune diabetes of adults (LADA)) compared with obese youths with Type 2 diabetes and non diabetic children, providing the distinction between these two forms of diabetes.

No conflict of interest

0490

Monogenetic causes

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Monogenic diabetes accounts for around 10-20% of the non Type 1 diabetes in children. The genetic aetiology of most subtypes of monogenic diabetes is now defined and is used to confirm a clinical diagnosis. The previously clinically defined maturity-onset diabetes of the young (MODY) is now defined by etiological mutations in the glycolytic enzyme glucokinase and the transcription factors. Glucokinase patients have mild stable hyperglycemia and rarely require treatment or develop complications, while patients with transcription factor mutations show progressive hyperglycemia and may have severe complications if not appropriately treated. The most striking evidence of pharmacogenetics is in HNF-1a MODY where, in a randomized trial there was a 4 x greater fall in fasting glucose than in BMI matched type 2 patients. HNF-1a patients' glucose control can be improved by taking them off insulin injections after many years and putting them on sulphonylureas.
Diabetes diagnosed in the first 6 months of life is almost entirely monogenic diabetes rather than Type 1 diabetes and is known as neonatal diabetes. Most patients with the resolving transient neonatal diabetes (TNDM) have abnormalities in the imprinted region on 6q and over 50% of PNDM have mutations in the Kir6.2 and SUR1 components of the KATP channel. Despite being insulin dependent, Kir6.2 and SUR1 patients can discontinue insulin injections and show improved glycaemic control on high dose sulphonylureas which act to close the K_{ATP} channel by a non ATP dependent route.
The widespread introduction of diagnostic testing in diabetes has resulted in being able to make a molecular genetic diagnosis which helps explain the clinical features, predicts prognosis and can improve treatment (see www.diabetesgenes.org)

No conflict of interest

0491

Developing countries

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Type 1 diabetes accounts for the majority of diabetes in children worldwide. However, considering the rising prevalence of obesity and decrease in physical activity in youth that also affects developing countries, an increasing frequency of type 2 diabetes is anticipated. In addition, atypical presentations of diabetes of uncertain classification are seen in young Africans. Ketosis-prone type 2 diabetes (KPD) is one of the most frequent unusual diabetes phenotypes in Africa. KPD is characterised by ketosis or keto-acidosis at onset but a subsequent clinical course resembling type 2 diabetes. This phenotype is recognised worldwide, but tends to present with the highest frequency in populations of African descent in all age groups. KPD may represent 15-25% of all diabetes cases in Africans living in Europe and USA, as well as in populations living in sub Saharan Africa. In order to contribute to a better classification and care of adolescent with diabetes, we recently studied 29 consecutive consenting insulin-treated adolescents followed for diabetes in Yaoundé, Cameroon. After an overnight fast, we measured insulin secretion in response to 75-g oral glucose, and on a separate day, whole body insulin sensitivity using 80mU/m2/min euglycemic hyperinsulinemic clamp. We demonstrated that 67% of the diabetic patients had insulin resistance, while 60% had absolutely deficient insulin response. There was an overlap of these two metabolic abnormalities in 27% of cases. Overall, based on these metabolic characteristics, we could classify 40% of patients as having type 2 diabetes, 33% as type 1 and 27% as having double diabetes. Thus, we concluded that even in sub-Saharan youth, type 2 diabetes is no longer rare. Epidemiological studies are warranted to provide accurate estimates of relative proportions of diabetes subtypes.

No conflict of interest

SYMPOSIUM

FOUNDATION SCIENCE

Which will be the best alternatives to replace the lost ß-cells in diabetes?

0492

Human islet transplantation

C. Ricordi[1], *D. Mineo*[1], *A. Pileggi*[1], *R. Alejandro*[1]
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The primary goals of islet transplantation (ITX) are achievement of glycemic control in the absence of severe hypoglycemic episodes, improvement of quality of life, and prevention or reversal of the chronic, progressive complications associated with diabetes. Insulin independence, although desirable, is not considered a primary objective of ITX. C-peptide production following islet transplantation may contribute to some of the improvement of diabetic complications observed post-transplant. However, in the context of ITX, a decline of renal function has also been reported in some studies, while more recent reports have shown stable renal function and lack of worsening diabetic nephropathy at long-term follow-up, or an initial decline of renal function that stabilizes without further worsening in the long-term. Strict selection of islet transplant candidates without previous renal dysfunction (***i.e.***, micro-albuminuria and low estimated glomerular filtration rates) and timely implementation of nephro-protective and anti-hypertensive therapies (i.e., Angiotensin-Converting Enzyme inhibitors and/or Angiotensin-Receptor Blockers) may have accounted for the different clinical outcomes observed across different ITX studies. Immunosuppressive protocols void of nephrotoxicity are highly desirable, and indeed, ongoing clinical trials are showing promising results in patients undergoing conversion of either CNI or mTOR-inhibitors to MPA maintenance, with preservation of both renal and islet function. While a steady progress in the 1-year and 5-year ITX survival has been observed, the benefits of ITX need to be carefully weighed against the risks associated with the need for chronic immunosuppression and its side effects. The clinical applicability of ITX beyond the most severe cases of Type 1 DM will require the development of successful immunosuppressive regimens that minimize or eliminate nephrotoxic drugs, and the introduction of novel strategies to

replace systemic immunosuppression with local immunomodulatory strategies, nanoencapsulation and tolerance induction, which are currently being explored in pre-clinical and clinical trials.

No conflict of interest

0493

Xenotransplantation - can porcine islets solve the supply problem?

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One of the main obstacles for successful widespread clinical islet transplantation is the limited availability of insulin-producing tissue. Porcine islets are an attractive source of ß-cells for clinical transplantation because pigs breed rapidly, have large litters, and would be ethically acceptable. Reproducible isolation of large numbers of islets from adult pigs has been challenging and very difficult. We developed a simple, inexpensive and reproducible method to isolate a large number of neonatal porcine islets (NPI). NPI are comprised of fully differentiated endocrine cells (45%) and endocrine precursor cells (55%). We have shown that these NPI grafts grow and are able to reverse hyperglycemia after transplantation in mice and allogeneic juvenile pigs. More recently we have data to show that NPIs are resistant to the toxic effects of high glucose, pro-inflammatory human cytokines, hypoxia and the diabetogenic properties of streptozotocin**.** Moreover, we have recently demonstrated that NPI can correct diabetes in a pre-clinical, non-human primate model. In this study seven pancreatectomized primates received NPI grafts and a costimulation blockade-based immunosuppressive regime consisting of induction therapy with two doses of basiliximab (anti IL-2 receptor mAb) and six doses of H106 (humanized anti-CD154 mAb), given over a 2 week period. In addition, animals received ongoing maintenance therapy with belatacept (LEA29Y, a high affinity CTLA4-Ig variant) and sirolimus. Six of the seven animals achieved and sustained insulin independence that was associated with excellent glucose control for the length of the experimental follow-up, with one recipient at >300 d. We therefore feel that NPIs will be the near-term solution to the islet supply problem whereas possibly the more long-term solution may be the use of human pancreatic islet cell precursors to create human insulin-secreting cells.

No conflict of interest

0494

Pancreas transplantation

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Beta cell replacement, by either pancreas or islet allo-transplants, has been done for over 3 decades. Islet transplantation is minimally invasive but logistically more difficult than pancreas transplantation, thus the latter is still more widely applied. Pancreas transplants routinely restore insulin-independence and euglycemia that is durable unless rejection occurs. Islet transplantation engrafts less beta cell mass and is less likely to establish insulin-independence, but a C-peptide positive state with euglycemia maintained on once daily long-acting insulin is now routinely achieved. With either form of beta cell replacement, immunosuppression is currently required as the trade-off for ameliorating diabetes in attempt to improve quality of life.
Due to the need for immunosuppression, a pancreas (PTA) or islet transplant alone is usually done only in diabetics with hypoglycemic unawareness (HGUA). For nephropathic diabetics who receive a kidney transplant to prevent the need for dialysis, a simultaneous (SPK) or subsequent (PAK) pancreas or islet transplant from a living (segment of the organ) or deceased (whole organ) donor can be done with only the surgical risks to be considered. At least for pancreas transplants, SPK and PAK are more common than PTA, with PAK a particularly attractive option for the ability to do a living donor kidney to preempt the need for dialysis followed by a deceased donor pancreas to achieve insulin-independence.
Neither pancreas nor islet allo-transplants can treat all who could benefit because of the shortage of deceased or living donor tissue. In the USA there are only ~ 7000 deceased organ donors annually while there are >30,000 new cases of type 1 diabetes. Thus, ultimately, either xeno-grafts will solve the shortage (pig to monkey islet transplants can reverse diabetes), or stem cells will be an unlimited source, or endogenous regeneration induced with thwartation of autoimmunity in type 1 diabetes mellitus accomplished.

Meanwhile, pancreas or islet allografts can be done, alone in patients with HGUA, or in any diabetic on immunosuppression (usually for a kidney transplant) in whom the surgical risk is acceptable. More than 30,000 pancreas transplants were reported to the International Pancreas Transplant Registry between 1966 and 2008, including >22,000 from the USA. In a recent analysis of >5800 USA cases done in 2004-8, the 1 yr actuarial patient survival rates for SPK (n=4206), PAK (n=1136) and PTA (n=491) recipients were 95%, 97% and 96%, respectively, and at 3 yrs were over 90% in all categories. The corresponding pancreas graft survival (insulin-independence) rates at 1 yr were 85%, 79% and 79%, and were 59%, 65% and 79% at 3 yrs. The insulin-independent rates currently are much higher long term for pancreas than islet transplants, though C-peptide positive rates are comparable.
Islet transplants are preferable to pancreas transplants from a surgical standpoint, but until the insulin-independence rates for islets are comparable, the logistics of organ procurement for expeditious islet processing are improved, and non-investigational status is granted to islets so insurance coverage is similar to that for pancreas transplant, the latter will continue to be done, with good results as demonstrated.

No conflict of interest

0495

Technological approaches to closing the loop

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In the last several years there have been major advances in the development of real-time continuous glucose monitors. This progress has facilitated the development of closed loop systems consisting of a continuous interstitial glucose sensor linked to a continuous subcutaneous insulin pump by a control algorithm to produce an electromechanical pancreas. Prototype versions of this technology have shown promise in preventing and treating hypoglycemia, and optimizing nocturnal glycemic control.

No conflict of interest

SYMPOSIUM

HEALTHCARE AND EPIDEMIOLOGY

New IDF diabetes guidelines

0496

Type 2 diabetes update

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In 2005, the IDF Clinical Guidelines Task Force developed global guidelines for the care of people with type 2 diabetes. The significant development with this guideline was an attempt to make the guideline recommendations globally relevant by introducing levels of care approach which took into account human and material resources in making recommendations. Central to this levels of care approach was standard care which is the level of care which should be available to all people with diabetes. But in recognition of the difficulty in delivering this level of care in many parts of the world, a minimal care level was also used to describe the most basic care which a person with diabetes should receive, recognising that in many parts of the world not even this level of care was being achieved. At the other end of the spectrum was comprehensive care. Since these guidelines were produced in 2005 new evidence has become available and, in the light of this, the guidelines have been updated to provide more contemporary recommendations, although many recommendations remain unchanged. The updated guidelines also include new sections (eg on care of the elderly with diabetes) and each section suggests indicators to monitor progress on implementation of the guideline recommendations.
The ralionale for producing these guidelines is to help countries examine their own guidelines in light of new knowledge. For those countries which do not have their own guidelines, these guidelines are deigned to provide a template for developing locally relevant clinical care recommendations.

No conflict of interest

0497

Global IDF/ISPAD guideline for type 1 diabetes in childhood and adolescence

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Education is the vehicle for optimal self-management. ISPAD published its first set of guidelines in 1995 and its second in 2000, placing the education at the center of clinical management of pediatric diabetes. Since then, the acceptance of intensive therapy, also for very young children, has increased around the world. Insulin pump usage has risen in all age groups in countries where this treatment modality can be afforded. Intensive therapy requires better and more comprehensive education for it to be successful.
The ISPAD Consensus Guidelines 2000 have been translated into 11 languages, indicating the need for a truly international document. The 3rd edition, now called "ISPAD Clinical Practice Consensus Guidelines" was published 2006-2008 as separate chapters in the journal Pediatric Diabetes. We have used the American Diabetes Association's grading system for references. Whenever possible, pediatric references have been included, as we want to stress the point "diabetes is different in children".
The guidelines are based on a wide consensus of clinical practice. They were drafted by international writing teams, modified by experts in different specialties from many countries, debated at annual ISPAD meetings by the members, and were reviewed by members via the internet and the ISPAD website.
In 2008 ISPAD was asked by IDF to write a summarized version of our pediatric diabetes diabetes guidelines using the IDF template of Standard, Comprehensive and Minimal Care levels.
These guidelines can be used to:

- improve awareness among governments, state health care providers and the general public of the serious long-term implications of poorly managed diabetes and of the essential resources needed for optimal care
- assist individual care givers in managing children and adolescents with diabetes in a prompt, safe, consistent, equitable, standardized manner in accordance with the current views of experts in the field.

No conflict of interest

0498

Pregnancy

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Pregnancy is associated with changes in insulin sensitivity which may lead to changes in plasma glucose concentrations. For women with known diabetes or for women who develop diabetes during the pregnancy, these changes put outcomes at risk. The IDF Pregnancy Guideline deals with the means of identifying women for whom such problems are new, and helping them, as well as women already known to have diabetes, to achieve the desired outcome of a healthy mother and baby. Within the IDF Global Guidelines for Type 2 Diabetes (IDF 2005) there was a section on pregnancy, but these Guidelines did not address type 1 diabetes and did not consider the wider issues surrounding gestational diabetes mellitus and prevention of diabetes. The new IDF Pregnancy Guideline includes these other topics, and attempts to present some of the evidence bearing on areas of controversy. The new IDF Pregnancy Guideline was necessary because since 2005 an evidence-based guideline on diabetes in pregnancy has been published in the UK (NICE 2008), the Canadian evidence-based diabetes guideline (including pregnancy) has been revised (CDA 2008), and there has been further deliberation on the implications of the Hyperglycemia and Adverse Pregnancy Outcome Study (HAPO 2008). In preparing the new IDF Pregnancy Guideline, a non-formal evidence review was prepared and discussed by a Working Group in March 2009 and reviewed by an Expert Review Committee. The aim was to recommend Standard Care as envisaged in the Global Guidelines. This lecture will review the major sections of the new IDF Pregnancy Guidelines and highlight the changes and emphasize the treatment targets.

No conflict of interest

0499

Self-monitoring

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Recent studies have raised important issues regarding the value and utility of self monitoring of blood glucose (SMBG) in non-insulin-treated diabetes (T2DM). In October, 2008, the International Diabetes Federation (IDF) and the SMBG International Working Group convened a conference in Amsterdam to address these issues. Participants included clinical investigators who are actively engaged in SMBG research/research translation. The purpose of the conference was to: 1) review key studies describing the clinical/metabolic impact and the cost-efficiency of SMBG; 2) identify additional studies/study designs that are needed to further define the role of SMBG in T2DM treatment; and 3) identify meaningful approaches for using SMBG in clinical practice to improve treatment outcomes. Participants determined that findings from studies of SMBG used in non-insulin-treated diabetes have been inconsistent due to differences in study designs, populations, and interventions used. Several limitations of published studies, both for and against SMBG, were identified. However, participants agreed that available data do suggest that SMBG is only likely to be an effective self-management tool when results are used appropriately. The following recommendations are proposed: 1) SMBG should be used only when individuals with diabetes and/or their healthcare providers have the knowledge, skills and willingness to incorporate SMBG monitoring and therapy adjustment into their care plan to attain agreed treatment goals; 2) SMBG should be considered at the time of diagnosis to enhance the understanding of diabetes and to facilitate timely treatment initiation and titration optimization; 3) SMBG should be considered as part of ongoing diabetes self-management education to promote better understanding and provide a means for persons with diabetes to actively and effectively participate in its control and treatment, modifying behavioural and pharmacologic interventions as needed; 4) SMBG protocols should be individualized to address each individual's specific educational/behavioural/clinical requirements and provider requirements for data on glycemic patterns and monitor impact of therapeutic decision making; 5) The purpose(s) for performing SMBG and using SMBG data should be agreed upon and subsequent review of data should be documented; and 6) An easy procedure for patients to regularly check on their glucose meter performance should be a requirement for SMBG use. Additional studies are needed and should focus on SMBG as an integral component of diabetes management rather than an independent intervention. Because SMBG can be a component of many different treatment strategies, it is important to study different aspects of SMBG use across the broad spectrum of patient care.

Conflict of interest:
Paid lecturing: David Owens - Roche Diagnostics, Sanofi-Aventis, Novo Nordisk, Merck Sharpe & Dohme, LifeScan and Pfizer.
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JJ Gagliardino - no conflict of interest.
Steve Colagiuri - no conflict of interest.
Other substantive relationships: None

0500

Oral health

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On the basis of clinical experience, interest is growing on the relationship between oral health and diabetes. However a number of questions still wait for definite answers. In particular, it is not clear whether 1) any pathogenetic association exists 2) oral diseases are expressed with higher prevalence in people with diabetes, 3) suboptimal metabolic control deteriorates oral health, 4) oral diseases induce metabolic instability, 5) periodontitis is the only oral disease related to diabetes, or other conditions like caries, oral infections, xerostomia, etc. can be considered, 6) periodontitis can be considered a microangiopathy-related diabetes complication, 7) specific attention for oral health is to be given to people with diabetes or the already existing indications for prevention and treatment in the general population are sufficient. In order to initiate a process leading to better understanding of such topics, the International Diabetes Federation (IDF) and the International Federation of Dentistry (IFD) joined forces and under the umbrella of the IDF Task Force on Guidelines and, following the "IDF Guidelines for the preparation of guidelines", a document has been produced by an editorial group representing both Federations and comprehensive of members coming from all the IDF Regions. The necessary resources for the production of the Guidelines were generously made available by the Kuwait Foundation for the Advancement of Science. As a result of the analysis of the existing literature it has not been possible to provide exhaustive evidence based answers to the given questions: 1)What level of surveillance for periodontal diseases should be recommended for people with known diabetes? 2) Is active management of periodontitis particularly recommended for people with diabetes? While it has been considered that the already existing guidelines for the general population need to be fully supported by the Diabetes care providers, a strong call for research has been launched to provide the required evidence.

No conflict of interest

0501

Sleep apnoea

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Increasing evidence over recent years has shown that links exist between obstructive sleep apnoea and type 2 diabetes. Much of the association between the two conditions is due to the links that each condition has with obesity. However, a number of studies have suggested that obstructive sleep apnoea predicts the development of type 2 diabetes independently of obesity, and that several features and consequences of obstructive sleep apnoea have a direct effect on carbohydrate metabolism.
Obstructive sleep apnoea is very common in people with diabetes, being reported in up to 90% of patients, and is likely to make blood pressure more difficult to control, increase cardiovascular risk and possibly worsen glycaemic control. Thus, despite most patients with type 2 diabetes being unaware of the presence of obstructive sleep apnoea, screening for obstructive sleep apnoea may be of value, as treatment may improve daytime sleepiness, and reduce cardiovascular risk. Uncertainty remains over how to screen for obstructive sleep apnoea, as the gold standard in-patient polysomnography is not widely available in the developing world and waiting lists for such investigations are often long in the developed world. Focusing screening on those people who report snoring and daytime sleepiness (as they are more likely to comply with treatment), and the use of domiciliary oximetry-based investigations may provide a more practical approach to the identification of undiagnosed obstructive sleep apnoea.
Among people diagnosed with obstructive sleep apnoea, a full assessment of their metabolic status is essential. Such individuals should be screened for diabetes as well as lipid abnormalities and hypertension. To improve patient symptoms and outcomes, it is essential that healthcare professionals primarily involved with the management of either diabetes or obstructive sleep apnoea recognize the likely presence of the other condition, and take appropriate steps to investigate and treat the other condition.

Conflict of interest:
Paid lecturing: J Shaw. ResMed.
Advisory board: J Shaw. ResMed
Commercially-sponsored research: J Shaw. ResMed

TEACHING LECTURE

FOUNDATION SCIENCE

Beta cell mass in the pathogenesis of type 2 diabetes: is it the critical component?

0502

Beta cell mass in the pathogenesis of type 2 diabetes: is it the critical component?

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It has become quite clear that deterioration of beta-cell function predicts and precedes onset of T2D, but it is not known whether this is due to functional defects or a reduction in beta-cell mass. Islet beta-cells are dynamic and must adjust to the needs imposed by e.g. insulin resistance. A typical situation is pregnancy, during which islet mass increases to compensate for the demands imposed by the insulin resistance characteristic of pregnancy. Autopsy studies suggest that patients with T2D show a more than 50% reduction in their beta-cell mass. Recent genetic studies also support the view of a defect in beta-cell mass and cell proliferation. Many of the novel genetic variants increasing susceptibility to T2D encode for cell cycle proteins (CDKAL1) or proteins involved in beta-cell proliferation (TCF7L2). Also carriers of high risk genotypes (the highest 20% risk) cannot increase their insulin secretion to compensate for the increase in insulin resistance. Another surprising finding has been that the same genetic variants which can increase risk of e.g. prostate cancer (HNF1b, JAZF1) or colon cancer (TCF7L") might protect from T2D or vice versa. This has led to the Yin-Yang hypothesis that too much proliferation increases cancer risk but protects from T2D whereas too little proliferation (of beta-cells) increases risk of T2D but protects from cancer. A practical problem is that there are no perfect in vivo measures or images of beta-cell mass. Novel PET techniques might provide some crude tools but at the moment the best measure of beta-cell mass is to measure insulin and C-peptide response to a maximum stimulation by glucose and arginine or GLP-1.
Taken together, whereas existing data clearly demonstrate that failing beta-cells precede onset of T2D, more refined techniques will be needed to explore the relative role of functional defects versus a reduction in beta-cell mass.

No conflict of interest

SYMPOSIUM

CLINICAL RESEARCH

Extrapancreatic effects of the incretins

0503

Basic considerations of incretin action

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The two major incretin hormones are GIP (gastric inhibitory polypeptide/ glucose-dependent insulinotropic polypeptide) and GLP-1 (glucagon-like peptide-1). Both GIP and GLP-1 receptors are expressed in pancreatic β-cells, and GIP and GLP-1 contribute similarly in the promotion of insulin secretion soon after meal ingestion. However, the actions of these incretins can readily be distinguished by their extrapancreatic effects, the physiological importance of which has been clarified using receptor-knockout animal models. Extrapancreatic GIP receptors are found in adipose tissue, stomach, small intestine, osteoblasts, and several regions of the brain. The effect of GIP on fat accumulation is one of its most important extrapancreatic actions. GIP signal inhibition prevents the accumulation of excess fat, ameliorating the accumulation of adiposity by increasing fat oxidation in peripheral tissues, which reduces insulin resistance and improves glucose tolerance. Moreover, in the gastrointestinal tract, GIP inhibits glucose absorption by reducing motility of the small intestine via somatostatin. GIP also has an anabolic effect on bone by protecting osteoblasts from apoptosis. Inhibition of GIP receptor signaling causes high turnover osteoporosis with elevated postprandial plasma calcium levels and increased osteoclastic bone resorption in mice, suggesting

that GIP may link calcium ingested in a meal to its deposition in bone. On the other hand, GLP-1 receptors are expressed in brain, lung, and heart, and the importance of brain and portal GLP-1 receptor signaling in its glucose-lowering effects has been demonstrated. The incretins thus play an integrated and complex role in glucose homeostasis and nutrient intake through both pancreatic and extrapancreatic effects.

Conflict of interest:
Advisory board: Novo nordisk, Takeda, Banyu, Novartis, Eli Lilly, GSK

0504

Brain effects

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The traditional model of GLP-1 action is that of a hormone that is secreted by the distal intestine and acts on distal organs to regulate energy balance. This presentation will focus on other aspects of GLP-1 biology that challenge the notion of GLP-1 as a hormone. In particular, growing evidence implicates the CNS as a key site of GLP-1 action not just to regulate food intake but also to regulate blood glucose levels. Implications for GLP-1-based therapies will be discussed.

Conflict of interest:
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Stock ownership: Zafgen Inc
Advisory board: Eli Lilly, Zafgen Inc, Johnson & Johnson
Commercially-sponsored research: Amylin Pharmaceuticals, Johnson & Johnson

0505

Incretin biology in the skeleton and cardiovascular system: direct and indirect mechanism

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Gut hormones are secreted at low basal levels in the fasting and inter-prandial state and circulating levels of most gut hormones increase rapidly following nutrient ingestion. Evidence from rodent and human studies suggests that bone resorption increases significantly in the fasting state, and also falls rapidly following nutrient ingestion. Multiple gut hormones suppress bone resorption following exogenous administration in rodents, and genetic disruption of gut hormone action in mice is associated with a panoply of phenotypes in the skeleton. Specifically, Gipr-/- and Glp1r-/- mice exhibit reduced bone sensitivity via different direct and indirect mechanisms. Gut hormones also regulate cardiovascular function through indirect effects on the autonomic nervous system leading to control of vasomotor function and blood pressure. Moreover, gut hormones may exert direct effects on cardiomyocytes, including regulation of metabolic pathways and cell survival. Gut hormone metabolism, as exemplified by studies of glucagon-like peptide-1, may produce additional diversity in the cardiovascular system, through generation of structurally related peptides which regulate cardiac function through distinct mechanisms. The extrapancreatic biology of incretins, with a focus on skeletal and cardiac biology, will be reviewed.

Conflict of interest:
Other substantive relationships: See http://www.glucagon.com/druckerlab.html for disclosures

0506

Inhibition of DPP4 activity

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Dipeptidyl peptidase (DPP)-4 inhibitors are a new class of antidiabetic drugs which, by blocking the enzymatic activity of DPP-4, raise endogenous intact incretin concentrations and result in improvement of glycaemic control. Two inhibitors (sitagliptin, vildagliptin) are already available, and others are undergoing regulatory authority review (saxagliptin, alogliptin) or are in late-stage clinical development (eg linagliptin and others). Although all are small, orally active compounds with selectivity for DPP-4 (versus other DPP-4-like enzymes), the inhibitors differ in their chemistry and pharmacokinetic profiles. Vildagliptin and saxagliptin are peptidomimetics, based upon the dipeptide substrate for DPP-4, while sitagliptin (β-amino acid-based), alogliptin (modified pyrimidinedione) and linagliptin (xanthine) are non-peptidomimetic. Sitagliptin, alogliptin and linagliptin are not appreciably metabolised in vivo, whereas vildagliptin and saxagliptin undergo hepatic metabolism (to an inactive [vildagliptin] or active [saxagliptin] metabolite). Sitagliptin, vildagliptin, saxagliptin and alogliptin (and the vildagliptin and saxagliptin metabolites) are renally excreted, whereas linagliptin has a hepatic route of elimination. The pharmacokinetic half-life varies (from 1½ - 4½ hours for vildagliptin up to 10-40 hours for linagliptin), and although saxagliptin and linagliptin have greater potency (anticipated doses, 5 mg qd) compared to alogliptin (anticipated dose 25 mg qd), vildagliptin (50 mg bid) and sitagliptin (100 mg qd), plasma DPP-4 activity is inhibited by >80% over the full 24-hour period with the therapeutic doses. This is sufficient to raise intact incretin concentrations 2-3-fold, and it therefore seems likely that the anti-hyperglycaemic efficacy of the inhibitors will be similar. As a class, the DPP-4 inhibitors are well-tolerated (side-effect profile similar to placebo), and they lower fasting and postprandial glucose levels with a low risk of hypoglycaemia and without weight gain. They are efficacious as monotherapy, while providing predictable additional efficacy when used in combination with other antidiabetic agents.

Conflict of interest:
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Stock ownership: n/a
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Commercially-sponsored research: n/a
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TEACHING LECTURE

LIVING WITH DIABETES

Psychological stress: cause and effect

0507

Psychological stress: cause and effect

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All organisms exist through maintenance of a complex dynamic equilibrium, homeostasis, which is constantly challenged by intrinsic or extrinsic adverse forces, the stressors. Stress occurs when homeostasis is threatened or perceived as threatened; homeostasis is then re-established by various physiologic and behavioral adaptive responses. Neuroendocrine hormones have crucial roles in the coordination of both basal and threatened homeostasis and mediate the pathogenesis of dyshomeostatic or cacostatic disease states. The stress response is subserved by the stress system, which is located both in the central nervous system and the periphery of the organism. The central effectors of this system are highly interlinked, and include the hypothalamic hormones arginine vasopressin, corticotropin-releasing hormone (CRH) and proopiomelanocortin-derived peptides, and the locus ceruleus and autonomic norepinephrine centers in the brainstem. The peripheral effectors are their end-hormones cortisol, norepinephrine, epinephrine and immune CRH. The targets of these effectors include the executive/cognitive, reward, and fear systems, the wake/sleep centers of the brain, the growth, reproductive and thyroid hormone axes, as well as the gastrointestinal, cardiorespiratory, metabolic, and immune systems. Appropriate basal activity and responsiveness of the stress system is a crucial prerequisite for a sense of well-being, successful performance of tasks, and positive social interactions. By contrast, inappropriately elevated or decreased basal activity and/or responsiveness of this system might impair growth, development and body composition, and may account for many behavioral and somatic pathological conditions. The former include anxiety, depression, psychosomatic disorders, chronic pain and fatigue syndromes, chronic insomnia, and addiction; the latter hypofertility, visceral obesity, metabolic syndrome with or without diabetes mellitus type 2, sleep apnea, and osteopenia/osteoporosis, along with chronic inflammatory cardiovascular and neurovascular sequelae. Chronic stress is thus a major factor of accelerated aging with multiple associated morbidities and premature mortality.

No conflict of interest

SYMPOSIUM

Interaction of aetiological factors in type 2 diabetes - key to prevention?

0508

Genetics

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Type 2 Diabetes (T2D) is a multifactorial disease with significant genetic and environmental components. In the last 2 years there has been an exponential increase in the number of genes associated with disease; from 3 to over 20. These include genes in cell cycling control, transcription factors and cell signalling. Many of new genes associated with diabetes are involved in pancreatic beta cell function, underlining the importance of defects of insulin secretion as a prime cause of T2D; other genes identified mediate their effect on weight balance. Recent gene discovery has been made possible by rapid changes in the technology (bioinformatics and analysis) and the use of adequately powered studies to detect modest size effects (odds ratio between 1.1-1.4). Despite this rapid progress, the genes identified do not explain the majority of the genetic component of T2D, indicating that there is likely to be another incremental step required to understand the genomics of diabetes. Additional approaches include mapping aetiological SNPs, study of CNVs, investigation of rare variants accounting for common disease, expression profiling and epigenetics.
The study of epigenetics provides a direct link with the triggering environmental component. For many years it has been realised that ***in utero*** nutritional factors can prime the foetus towards insulin resistance and diabetes. Genome-wide epigenetic reprogramming occurs during gametogenesis, implicating early foetal development as a period susceptible to environmental influence. There is also evidence of trans-generational effects of environmental factors associated with diabetes that can be reversed by correcting the nutritional deficiency. The field of epigenomics is rapidly evolving with a movement away from the study of single genes to whole genome platforms. It is hoped that these advances will provide some of the missing clues in T2D, but more importantly lead to novel strategies to prevent and treat the disease.

No conflict of interest

0509

The role of the intra-uterine environment in the aetiology of type 2 diabetes

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Epidemiological studies have revealed that there is a relationship between poor early growth and the development of type 2 diabetes. Compelling evidence has emerged over the last fifteen years to suggest that early environmental factors such as nutrition play an important role in this relationship. Studies of individuals who were ***in utero*** during a period of famine, the Dutch Hunger Winter, have shown a direct relationship between maternal nutrition and glucose tolerance in the offspring. Further support for the importance of the fetal environment has come from studies of monozygotic twins who were discordant for type 2 diabetes. These revealed that the diabetic twins had significantly lower birth weights than their non-diabetic co-twins. A number of animal models have been developed to investigate the mechanisms by which the early environment determines future susceptibility to disease. The most extensively studied is the maternal low protein model where rats are fed a low (8 %) protein diet during pregnancy and lactation. The offspring have a low birth weight and undergo an age-dependent loss of glucose tolerance. This is associated with ß cell dysfunction and insulin resistance. The ß-cell dysfunction is accompanied by reduced expression of the transcription factor HNF4a and the insulin resistance is associated with changes in expression of key insulin-signalling proteins (including protein kinase C zeta and the p110ß catalytic subunit of PI 3-kinase) in muscle and adipocytes. These changes in insulin signalling protein expression are strikingly similar to that observed in tissue biopsies from young men with a low birth weight. These proteins may be molecular markers of early growth restriction and thus disease risk. The molecular mechanisms by which a phenomenon that occurs ***in utero*** has a phenotypic consequence many years later are only just starting to emerge and are thought to involve epigenetic modifications.

No conflict of interest

0510

Stress in early life

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There is a large body of human and animal evidence showing that adverse environments during fetal life or infancy are linked with a higher prevalence of diabetes in adult life. Animal experiments also show that these adverse early environments also result in a heightened biobehavioral response to stress, with increased activity of the classical mediators of the stress response, including the hypothalamic-pituitary adrenal axis and autonomic nervous system. These changes are transgenerational, affecting stress responses in subsequent generations. Recent studies suggest that the same processes operate in human populations and may have important consequences for the susceptibility to diabetes. The evidence suggests that an adverse early environment, or markers of an adverse environment such as low birth weight, are linked with long-term alterations in these neuroendocrine systems. However, these studies also demonstrate that there is a considerable degree of heterogeneity in the responses observed, which appear to depend on a variety of factors such as the nature or timing of the adverse exposure as well as the gender of the offspring. The mediators of these classical neuroendocrine responses such as cortisol and catecholamines are biologically potent and may directly influence diabetes susceptibility by means of their effects on metabolism. However, lifelong changes in the set point of these neuroendocrine systems triggered by early adversity may also influence the course of development during early life leading to the generation of a phenotype adapted for adult adversity. This may predispose to diabetes if the actual environment encountered in adult life differs from that expected, which is likely to occur, for example, with overnutrition and the development of obesity.

No conflict of interest

0511

Lifestyles intervention

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Type 2 Diabetes Mellitus (T2DM) affects nearly one in 20 adults worldwide and more than 300 million cases are projected worldwide by 2025. At time of diagnosis of T2DM there is often clinical evidence of diabetic complications. Strategies that focus on prevention of T2DM are essential and lifestyle intervention and/or pharmacological intervention have been extensively evaluated. Healthy living with due emphasis on diet and exercise was thought to prevent the occurrence of this disease even in the ancient world. Modern large-scale epidemiological studies have unequivocally proved this ancient wisdom right.
In the Diabetes Prevention Program (DPP) study lifestyle intervention (diet and exercise) reduced the incidence of diabetes by 58% in subjects with impaired glucose tolerance (IGT) whereas metformin demonstrated a 31% reduction. Studies from India and China confirm the effectiveness of lifestyle intervention in preventing T2DM. Recent studies have demonstrated that increased insulin sensitivity is a major factor in this risk reduction, with emerging evidence supporting an effect of physical activity on insulin secretion. In parallel to lifestyle intervention, research has focused on the prevention of T2DM with pharmacotherapy. Metformin, acarbose, thiazolidinediones (TZD) and orlistat reduce the incidence of T2DM by between 30-80% in IGT populations. The combination of metformin or TZD with lifestyle intervention does not have an added benefit in South-Asians. Use of pharmacotherapy can result in drug related adverse events, and there are long term concerns regarding safety, tolerability and compliance with such medications. Data from the DPP study indicate that the treatment effect of pharmacotherapy is not sustained after cessation of treatment. In a recent meta-analysis of T2DM prevention trials lifestyle intervention was as effective as pharmacological intervention.
Pragmatic and practical lifestyle interventions that delay or prevent the onset of diabetes which can be applied to 'real life' clinical practice are required.

No conflict of interest

SYMPOSIUM

EDUCATION

Peer and rural education

0512

Peer diabetes self-management support: does it work?

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In light of the growing prevalence and health care costs of diabetes, health care providers must improve the efficiency and effectiveness of their diabetes care. A key element of effective diabetes care is providing effective and sustained support for patients' diabetes self management. Peer support, defined as "support from a person who has experiential knowledge of a specific behavior or stressor and similar characteristics as the target population," may be a particularly potent means of providing sustained and flexible support for diabetes patients' self-management, combining the benefits of both receiving and providing social support. This presentation will provide a brief overview of different approaches to mobilize peer support for diabetes self-management, provide evidence to date on the relative effectiveness of each of these models with an emphasis on research on ways to extend face-to-face programs through the use of innovative technologies, discuss limitations of current research on peer support, and conclude with a discussion of directions for future research in this area.

No conflict of interest

0513

Role of lay health worker on primary prevention of type 2 diabetes

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The use of community health workers (CHWs) or lay health workers has been increasingly popular as a means to reach minority populations in hard-to-reach and underserved communities who have chronic conditions such as diabetes. The role of lay health workers in primary prevention of type 2 diabetes is an evolving area of interest in the public health arena. In 2009, the National Diabetes Education Program (NDEP) launched the Road to Health Toolkit (RTH) to assist CHWs in the prevention of type 2 diabetes. Following Diabetes Prevention Program study findings, toolkit messages emphasized lifestyle changes. Adult learning theory and Bandura's Social Cognitive Theory were used in the development of the RTH Toolkit to give CHWs guidance in encouraging and supporting behavior change. The purpose of the RTH Toolkit was to prepare trainers to train CHWs in African American and Hispanic/Latino communities, and, in turn, CHWs to use the Toolkit with their communities. This presentation will discuss the role played by CHWs in primary prevention of type 2 diabetes and lessons learned in using the Toolkit and train-the-trainer materials. A series of day-long English and Spanish sessions with CHWs and CHW trainers were implemented. We used information gathered from urban and rural CHWs and CHW trainers, both at these sessions and afterward, to better understand the roles of CHWs and determine tools needed in preventing type2 diabetes. Feedback from the sessions demonstrated that the utilization of CHWs or lay health workers as health educators for primary prevention of type 2 diabetes requires the development of effective training methods to prepare them to make a critical impact. To play a meaningful role, CHWs reported needing low-technology and portable tools, such as flipcharts. They also responded well to using a storytelling approach in the toolkit. Tools, such as the RTH Toolkit, can help increase the effectiveness and community participation of CHWs and allow them to be effective agents of change that contribute to the development, promotion and health recovery of underserved communities.

No conflict of interest

0514

Peer education in Cambodia

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Background: Cambodia's health services cannot meet the enormous and rising needs from people with diabetes. Innovative approaches are required to mitigate the impact of the rising epidemic. Since 2005, MoPoTsyo has been establishing diabetes 'peer educator networks' to detect and support diabetes patients.
Methods: The study is based on analysis of routine monitoring data on blood glucose, blood pressure and body weight for 386 rural diabetes patients who have been enrolled in the programme at least three months, and data from two assessments of a random sample of these patients, carried out in July 2008 and January 2009.
Findings: After 18 months, 10 peer educators had found 474 diabetes patients, two thirds previously unaware of their condition. The data on these patients indicate improvements in Fasting and Postprandial Blood Glucose, and Blood Pressure, even though half of them have not yet consulted a doctor. Their reported health expenditure appears much more affordable than that of most diabetes patients in Cambodia.
Interpretation: In the absence of a massive government or international response to the unmet needs of Cambodians with diabetes, peer educator networks may play a useful role in mitigating the disease's negative impacts on the lives of sufferers by providing a low cost but effective care structure despite the low resource environment.

No conflict of interest

0515

Volunteer educators of National Diabetes Program of Slovak Republic

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Aims: Diabetes mellitus (DM) is a metabolic and chronic disease which is not only a medical, but also an economic, social and societal problem for more than 350.000 registered diabetic patients in Slovakia. For improving the quality of life of diabetic patients, education, prevention of acute and chronic DM complications and prevention of the disease across the population, the National Diabetes Program of Slovak Republic (NDP SR) was issued in the year 2000.
Methods: The NDP SR started in 2002 and has been adopted by all 27 realization groups. From 2002 to 2004 it was financed through lottery and other similar channels but it would be better if there were more money for all realization groups. NDP SR Chief Coordinator is Doc. MUDr. Jozef Michalek, PhD., director of National Endocrinology and Diabetology Institute in Lubochna and Slovak Liaisor for the Saint Vincent Declaration. All group managers are volunteers. The NDP SR education system involves apart from other also educators from diabetic patients. Realization group Education of educators from diabetic patients in the field of DM is managed by Ms. Andrea Bukovská, Pharmacist-Assistant and Vice-President of Association of Diabetic Patients of Slovakia (ADPS). Besides new and large-scale preventive and screening programs, health monitorings, education activities for children and adults, very importantly the social counseling and more specific education started. According to this the most important is to prepare professionals. The best of this is studying of social work aimed at diabetology.
Results: By virtue of contract of ADPS and St. Elisabeth University College of Health and Social Work, Signatar of Magna Charta Universitarum Bologniense, from school year 2008/2009 special international study of social work for 46 educators from Slovak Republic and Czech Republic a 3-year Bachelor degree with following up 2-year Master degree study program started.

Conclusions: In conjunction with social work and diabetology a new model of complex health and welfare work by professional educators started. It will be the most effective way as to improve complex care of diabetic patients and risk general public is to have full time professionals.

No conflict of interest

WORKSHOP

ASSOCIATION DEVELOPMENT

The foot in diabetes: collaborations to improve care

0516

Association developed prevention initiatives: the foot initiative in Cyprus

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In 1979, a small group of diabetics and parents of insulin dependent children established the Cyprus Diabetic Association with offices in all towns. We are governed by a Board consisting of 17 members. Elections take place every three years at a General Assembly.
Aims: Support diabetics. Exercise pressure on the Government for better medical care. Establishment of Diabetic Clinics. Raise public awareness to fight ignorance. As volunteers trying to succeed we had to establish a financially strong association.
Diabetes is not just a health problem. It affects the person, the family and the state budget. Though there is no cure for diabetes, effective treatment exists.
Our annual budget is around Euros200.000. This covers: Running expenses, Salaries, Publications, summer camps, financial aid to needy persons.
Our sources are:

- Membership fee of Euro17pa
- Grant from the Ministry of Health and Social Services
- Contribution by Cooperative Societies & banks
- Donations from funerals and pharmaceutical companies

Diabetes is a pandemic with heavy financial burden on 10% of the population almost in every country. It is necessary to render assistance from specialists on payment. The association renders services on a voluntaty basis. We are the supporters of government services and we are the right-hand of the Minister of Health.
What should be done? Governments must support the Associations with generosity at least with 2% from taxes or even VAT. The pharmaceutical companies must support the Associations on an equal merit.
IDF must try to secure European Financial support from funds for NGO's. With regard to other regions, the same procedure has to be followed to the appopriate authorities. We expect more from pharmaceutical companies as we are their customers and it was stated by IDF we are co-partners. The needs of all associations are similar and very high. They must have independence in order to have a good background for the negotiations, especially with the Ministry of Health and other government services on a voluntary basis. We are the supporters of government services and we are the right-hand of the Minister of Health.
Activities: Lectures, Educational Seminars for doctors, nurses and supporters
Educational summer camps for all ages, excursions for adults
Christmas and Easter events
Athletic games
14th November WDD: This is extended for a week and we organised many. We organise press conference with the MOH, live programs through MM and the newspapers. We have booths in all towns making blood sugar analysis and giving leaflets on all matters concerning diabetes. We organise a run around Nicosia with the Slogan. Posters are sent to Hospitals, Villages and Municipalities. We light the Municipality with Blue colour.
Medical scheme: The Scheme covers 70% of the population with free treatment and medication. We are in the process of establishing a new Scheme.
Benefits: All diabetics have free examination, referral, Insulins, drugs, Laboratory analysis, Strips for glucose analysis.
Epidemiological research: In Cyprus the percentage is very high, compared with other EU countries. Between 2002 and 2004 a scientific research was carried out and the final result was that the percentage of diabetics is 10.3% of the population.
To tackle the problem of diabetes, we need to learn from each other's experience, especially from the developed countries.

No conflict of interest

0517

Lower extremity amputation prevention in the Philippines - the value of international collaboration

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The Philippines is a developing nation with a population of 90 million. In 2005, the National Nutrition and Health Survey reported a diabetes prevalence of 4.6% among adults aged 20 years or more. There are numerous diabetes clinics and diabetes specialists throughout the islands. However diabetes nurse educators are very few and diabetes education programs are limited.
In many hospitals, transfemoral amputation for infected diabetic foot lesions is quite common. In 1995, Mr. Ron Raab from Australia and who is now currently IDF Vice President, paved the way for an Australia Aid grant for footcare training in the Philippines. For five years, footcare and wound training for doctors and nurses were carried out in various regions by 2 Australian podiatrists and one wound specialist nurse. Subsequently, one endocrinologist went to the United States to learn the LEAP program-the Carville approach through a grant from the International Diabetes Federation Education Fund. She also observed various podiatry clinics in Singapore and King's College in London.
There are now some dedicated diabetes foot clinics. Data from the Diabetic Foot Clinic, East Avenue Medical Center (1999) show that foot ulcers are the most common presenting problem. Initial reports from this hospital have also shown a decrease in the rate of lower extremity amputations from 67% (1998) to 22% (2003). Through the national diabetes association and other private entities, foot workshops have been performed since 1996 to date. Physicians obtain knowledge updates by attending scientific conventions and through collaborations with the International Working group on the Diabetic Foot.
Interest in the diabetic foot remains high among physicians who appreciate the multidisciplinary nature of the specialty. Though much more has to be done, the presence of local champions will ensure that the progress that has been achieved so far will be sustained.

No conflict of interest

WORKSHOP

LIVING WITH DIABETES

Dealing with diabetes through narration

0518

Dealing with diabetes through narration

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Stories take an educational offering into its true realm of lived experience. Folktales and personal stories play a role in connecting the intellectual and emotional levels of diabetes information. This understanding translates into personal meaning which will serve to inform and shape a person's behavior. Stories told by patients to healthcare professionals provide helpful information that can reveal problems that may compromise attempts at self-management. Their stories can also reveal strengths to build on as they recall personal successes as well as a family history of courage and problem solving.

No conflict of interest

SYMPOSIUM

ASSOCIATION DEVELOPMENT

Initiatives which could be of help to other associations

0519

Improving the quality of life of people with diabetes in the 21st century: does IDF have a role to play?

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Quality of life is defined as individual´s perception of the position in life of the person in the context of the culture and value systems in which he lives and in relation to his goals, expectations, standards and concerns. Perception of the health status is modified by different factors: physical, social and psychological. The challenge for the team is to teach the self care of the diabetes taking into account experiences, expectations and believings.
We have to consider how to improve the quality of life of our patients through different ways: creating diabetes associations, making better professional training in the care of people with diabetes, fighting for accessibility, and considering education in special situations such as illiteracy.
The International Diabetes Federation has a challenge to create new tools for education to the patients, to emphasize interaction among pairs, with discussion, learning by playing and entertainment.
The Dawn programme reinforced the idea of attitudes, wishes and necessities of people with diabetes, studying the impact of social and psychological issues, observing that more than 40% has a great emotional suffering, that´s why IDF must consider this area.
Other point is the problem of illiteracy in patients with diabetes. It is difficult to imagine the dimension of the challenge faced by people with diabetes who cannot read or write. A great opportunity to share experiences and education with peers are the camps. In Argentina, there are a lot of them organized by the Federation of Diabetes, the Organization that joint Associations of Diabetes.
Other way to increase the quality of life is teaching the health team. In our experience an importan point is to teach nurses who impact on the quality of life of the patients because generally they are the first step in diabetes care.
We agree with the model that emphasizes the diabetes care centered in the patient with more independence, participation and decision making in contrast with that centered in the physician.
In summary, the quality of life depends on the level of education of the patient.

No conflict of interest

0520

Diabetes care in Taiwan: present status and possible solution

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The mortality of diabetes has remarkably increased from 3.7/100,000 in 1960 to 44.6/100,000 in 2007 in Taiwan. Due to launch of universal health insurance since year 1995, we could estimate the cost, complications in people with diabetes based on the claimed data.
With the database collected in 1996~2005, we observed an increasing trend in the prevalence of T2DM for both men and women, with the highest growth among those aged <40 and >80 by approximate 50% since year 1999 to 2004. During 1999~2004, we observed a decrease in the rate of newly diagnosed stroke, severe peripheral vascular disease, and severe eye disease, however, the incidence of severe cardiovascular disease and severe renal disease rose substantially, indicating a substantial increasing trend in T2DM disease burden in Taiwan, in particular a remarkable increase of incidence in young male individuals.
To help diabetes self management, since 2004 the Bureau of Health Promotion of the Department of Health of Taiwan has entrusted a non-governmental organization to develop the supporting program of diabetes patients self-help groups. Up to 2008, there are 437 groups (326 communal-based, 102 hospital-based, 9 NGO-based) formed to assist with diabetes prevention work in Taiwan. Which allows the diabetes patients, their families and high risk people to better understand, accept the diseases and to practice self-care that also allow better prevention and management of diabetes in the families and community as early as possible.
Due to governmental instrument, we hopefully can improve diabetes control at the national level in Taiwan.

No conflict of interest

0521

Is regional co-operation important for economically weak associations?

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The associations are powerful tools for advocacy. However, the objectives of the associations may exceed this depending on the resources available to them. Available resources have a direct impact in the effectiveness of the activities of associations. Thus, the ability to mobilize resources is an important criterion for judging the actual performance of associations. While associations may have a very strong influence in terms of mobilizing resources including financial, the new associations generally lack experience and have no budget. As associations that belong to the same region often share the same problems, the strongest associations and more experienced can share this experience with associations less experienced or weaker. Hence the value of cooperation. Based on the experience in West Africa, we present in this paper how weak associations can benefit from regional cooperation. This regional cooperation can be illustrated by the sharing of ideas and experience, but also by the value of the example to influence policy makers. This may illustrate the value of successful examples how associations can, in the same context, have a positive influence in the cause of diabetes. Thus, regional cooperation between associations is an exceptional teaching effectiveness that can benefit associations to resolve problems.

No conflict of interest

0522

Digital camera screening for diabetic retinopathy - experience from Ethiopia

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Similar to what is happening in other developing countries, diabetes with its chronic complications is fast becoming an important public health problem in Ethiopia. The magnitude of diabetic retinopathy in Ethiopia is not well known as there has not been screening programme for diabetic retinopathy. The Ethiopian Diabetes Association and the Diabetes Centre of Black Lion Teaching Hospital, Addis Ababa University with the direct support of Heart of England Diabetic Retinopathy Screening Centre (HEDRSC) of Excellence, Heartlands Hospital, Birmingham, UK have started a Programme called LEOPARD - Lions Ethiopian Ophthalmic Programme Against Retinal Diseases and Diabetes. Ethiopian staff were trained on digital camera screening for diabetic retinopathy in Birmingham. Similar technology and protocols to the English Diabetic Retinopathy screening programme have been introduced into the Black Lion Diabetes Centre (BLDC). Primary grading was performed by trained staff in the BLDC. All photographs were rechecked for quality assurance by HEDRSC grading staff. During the first year, a total of 493 diabetic patients completed the screening protocol (47% male, 51% female). Mean age 47 years (range 8 to 78 years). 33/493 (7%) patients had best binocular visual acuity (VA) of 6/60 or worse and 61/493 (12%) had best binocular VA of 6/36. Final grading showed that 190/493 (39%) patients had no DR and 58/493 (12 %) had ungradable image sets. Retinopathy status in the remainder (49 % of total) was background 17 %, pre-proliferative 7%, proliferative 4 % and 28% had referrable maculopathy. Inter-grader agreement between BLDC and HEDRSC was 92% for those returned to annual screening, 69% for those requiring urgent referral, and 98 % for specifically identifying sight threatening DR for referral. After 18 months screening, the digital camera technology employed is sustainable, and the BLDC trained staff have achieved accurate identification and referral for sight threatening DR.

No conflict of interest

SPEAKERS' CORNER

IDF through the decades: have we met our aims?

0523

IDF through the decades: have we met our aims?

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After the discovery of insulin, the dream of humanity was to eradicate diabetes and completely prevent it. Unfortunately, the diabetes caring community could never achieve this goal, in spite of the combined efforts of: (1) scientific progress, using advanced technologies, (2) efforts to improve clinical care and prevention procedures and (3) dedicated voluntary work by national and international diabetes caring associations.
Among the major current indicators of global failures in the fight against diabetes are: a high mean global prevalence 6%, which is still increasing, high incidence of several major complications (such as cardiovascular 22%, nephropathies 27%, retinopathies 32%, amputations 3%, etc) and an alarming total global mortality (3.2 millions/ year).
In spite of this, there are several positive global achievements, and the IDF has contributed very well to such achievements.
Among the highly evident achievements of the IDF is its rapid growth since it was established (now 200 member associations from 180 countries). An undoubted IDF success also is the huge development of global awareness about diabetes and its problems, which has been always promoted by the WDD celebrations and was finally rewarded by the UN Declaration on diabetes.
Other outstanding IDF achievements are in the field of education and in developing programs to improve performance of physicians and nurses in diabetes management.
These positive IDF contributions to global achievements were made possible through systematic and dynamic planning of a large spectrum of activities in the form of: periodic IDF Congresses, IDF publications and guidelines, establishing specific Task Forces for particular objectives, organizing workshops and training programs, and several other activities.

No conflict of interest

SPEAKERS' CORNER

LIVING WITH DIABETES

Living with diabetes: a family approach

0524

Living with diabetes: a family approach

M. Hirst[1]
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The diagnosis of type 1 diabetes presents particular challenges to the family, especially if the child is diagnosed at a young age. With parents understandably anxious and protective, is there a danger that the siblings may feel resentful at the attention given to their sibling with diabetes, or at the inevitable changes to normal family life following such a diagnosis?
While advances in insulin therapy and diagnostics procedures have certainly made care and treatment easier, there is still a strong emotional challenge for the family. Siblings should be encouraged to feel involved in the care of their brother or sister with diabetes, and should provide support in enabling that brother or sister to live as normal a life as possible.
Members Associations likewise have a role to play, not only in planning activities for young people with diabetes, but also in engaging in a practical way with their siblings.
A diagnosis of type 2 diabetes in a young person, though thankfully comparatively rare, represents a significant failure in parenting, and poses special challenges to the family. Can they all make the dramatic changes to their collective lifestyle in order to help the child who has been diagnosed? Does the psychological support necessary exist, and can it be accessed by the family? And if there is no change in the lifestyle circumstances which led to the diagnosis of type 2 diabetes, what hope is there for the child and other siblings? At what point should health authorities try to intervene, and what can they reasonably do?
Michael Hirst's presentation will reflect on the longer term effects on his family of diagnosis of type 1 diabetes in his youngest child nearly twenty-five years ago. Were there adverse consequences to the other members of his family, and how were they tackled?

No conflict of interest

SPEAKERS' CORNER

Turning diabetes to my advantage

0525

Turning diabetes to my advantage

G.M. Bunyan[1]
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Aim: Too often diabetes is seen as a "life sentence". It is someone else's fault, and someone else's problem, and if you organise your life around your diabetes, this will always be true.
Turning diabetes to your advantage is about taking control and responsibility. It's your diabetes and you have to decide how you want to live your life.
This presentation is about recounting experiences of someone with no more expertise than 30+ years living with diabetes: years of organising diabetes around a life and finding unexpected advantages.
The experience is just one of many of a life lived, with all of its successes and failures.
The "Unexamined Life"
On diagnosis you have two choices:
- to be a victim; or
- to take control

Socrates famously said the unexamined life is not worth living, and the same can be said of one's life with diabetes. Understanding it, taking control, engaging other people, managing one's partnerships, always searching for ways to live better with diabetes is essential. Unexamined, the diabetes life may not be worth living.
Turning diabetes to one's advantage is about:
- Taking responsibility
- Not being defined by one's diabetes
- Accepting it is "my diabetes" and taking control
- Recognising that diabetes and passion are not strange bed fellows
- Building one's knowledge and confidence to manage one's diabetes and - the medical team
- Telling stories to learn and to reflect on mistakes and to find better solutions
- Recognising the impact of one's diabetes on those closest to you
- Knowing how to influence change and taking the experience into one's life beyond diabetes
- Giving to others and reaping the professional, personal and health benefits
- Realising this is **not** all about you
- Never giving up

Dr Atul Gawande says that saving lives rests on lifting performance. Lifting one's own performance in the way one manages and lives with diabetes is all about living one's life fully, but this is just one story about taking the experiences diabetes can give you, and turning (some of) them to your advantage.

No conflict of interest

SYMPOSIUM

CLINICAL RESEARCH

Latest clinical trials

0526

4T final results

R.R. Holman[1], A.J. Farmer[1], M.J. Davies[2], J.C. Levy[1], J.L. Darbyshire[1], J.F. Keenan[1], S.K. Paul[1]
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Type 2 diabetes mellitus is a progressive condition in which glycated hemoglobin (HbA1c) levels rise inexorably over time as beta cell function declines. Maintenance of near-normal glycemia reduces the risk of diabetic complications but is difficult to achieve, despite the use of multiple oral antidiabetic agents. As a result, oral therapy requires repeated escalation, with the majority of patients requiring insulin in the longer term. There remains, however, considerable uncertainty as to which insulin regimen should be used when oral therapy becomes insufficient to maintain normoglycemia. Analogue insulins are now widely used but there is no consensus about whether therapy should commence with the addition of a biphasic, a long acting or a short acting insulin preparation, or when a second insulin formulation should be introduced. The Treating to Target in Type 2 Diabetes (4-T) is a 3-year, multicentre, open-label, randomized, controlled clinical trial conducted in 58 UK and Irish centres. A total of 708 patients with type 2 diabetes, who had suboptimal glycemic control while receiving maximally tolerated doses of metformin and sulfonylurea therapy, were randomized. We report the final results comparing the efficacy and safety of adding open-label analogue insulin to oral glucose lowering therapy using either twice-daily biphasic insulin aspart 30, once-daily detemir insulin (twice if deemed necessary) or pre-meal aspart insulin, with the substitution of sulfonylurea therapy by lunchtime insulin aspart, thrice-daily insulin aspart or detemir insulin respectively after one year if HbA1c levels were >6.5%.

Conflict of interest:
Paid lecturing: Rury Holman: Novo Nordisk, Eli Lilly, Sanofi Aventis; Jonathan Levy: Novo Nordisk; Melanie Davies: Novartis, Novo Nordisk, Sanofi-Aventis, Lilly, Merck Sharp & Dohme, and Servier
Advisory board: Rury Holman: Novo Nordisk, Eli Lilly, Sanofi Aventis; Jonathan Levy: Novo Nordisk; Melanie Davies: Novartis, Novo Nordisk, Sanofi-Aventis, Lilly, and Merck Sharp & Dohme
Commercially-sponsored research: Rury Holman: Novo Nordisk, Eli Lilly, Sanofi Aventis; Melanie Davies: Novartis, Novo Nordisk, Sanofi-Aventis, Lilly, Pfizer, Merck Sharp & Dohme, and Servier

0527

Update on ACCORD

M. Riddle[1]
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ACCORD is studying the effects of intensive glycemic control on cardiovascular (CV) outcomes in the context of defined levels of blood pressure and lipid control in persons with high CV risk. The intensive glycemic strategy was stopped early, after 3.4 median years of randomized treatment (about 60% of the planned time) due an unexpected excess of deaths. Subsequent analyses of epidemiologic relationships between mortality and the rate and degree of improvement of A1c itself have been performed, confirming analyses from other trials showing that higher average A1c is associated with higher mortality-risk. They also showed that the excess risk accompanying the intensive strategy occurred for persons who were unable to achieve A1c below 7%, rather than those who did reach that range of glycemic control. Similarly, analyses of the association between severe hypoglycemia and mortality-risk in ACCORD did not clearly confirm hypoglycemia as a major contributor to excess mortality accompanying intensive treatment. Rates of severe hypoglycemia were associated with higher rather than lower A1c levels. These findings focus attention on the participants who were unable to reduce A1c to the levels attempted with an intensive strategy in ACCORD. Analyses continue with the aim of identifying whether hypoglycemia, weight-gain, or specific drugs, drug-combinations, or drug-dosages may have contributed to increased mortality during intensive treatment. Later analyses after conclusion (at the end of June 2009) of the planned 5.6 median years of follow-up will add further information on mortality and other CV and microvascular endpoints accompanying the intensive strategy, as well as effects of randomized comparisons of strategies for treatment of hypertension and dyslipidemia in this population.

Conflict of interest:
Paid lecturing: Sanofi-Aventis pharmaceuticals
Advisory board: Amylin pharmaceuticals, Eli Lilly Inc, Sanofi-Aventis pharmaceuticals, Valeritas Inc
Commercially-sponsored research: Amylin pharmaceuticals, Eli Lilly Inc, Sanofi-Aventis pharmaceuticals, GlaxoSmithkline pharmaceuticals

0528

The ONSET trial of sensor-enhanced CSII in children with new onset type 1 diabetes

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[6] Hannover Medical School, Dept. of Medical Psychology, Hannover, Germany

This prospective, international multi-centre open randomised clinical trial (ISRCTN05450731) investigates if pediatric patients using a combination of insulin pump and realtime continuous glucose monitoring from the onset of Type 1 Diabetes have a better glycemic control after 12 months of type 1 diabetes than those using an insulin pump and conventional self-monitoring blood glucose (SMBG) finger-sticks. The last patient visit for the 12 month study period is September 2009.
160 children (aged 1-16, Mean±SD: 8,7±4,4 years.; 47,5% girls) were randomised within 4 weeks of diagnosis of type 1 diabetes into two groups: Group A (Medtronic Paradigm REAL-Time 522/722 insulin pump system with continuous glucose monitoring) versus Group B (Paradigm 515/715 insulin pump with conventional SMBG measurements). Group B was required to wear the Guardian REAL-Time Clinical (blinded continuous glucose monitor) for 6 days prior to two visits. Each subject participated for 15 months, which includes 12 months treatment and 3 months follow-up. During study, patients regularly attended the outpatient clinic according to local standard care. Analysis of HbA1c, diabetes-associated autoantibodies, fasting C-peptide and Quality of Life (parents via KIDSCREEN-27-proxy and WHO-5, a screening-method for disorders of affection, children (≥8yr) via KIDSCREEN-27) will be performed during study.
Data will be presented for the first time regarding the primary objective of the study: to determine whether pediatric patients using insulin pump system with continuous glucose monitoring from the onset of diabetes have a better glycemic control after 12 months than those with CSII and SMBG. In addition, it will be evaluated whether the use of sensor-enhanced pump therapy from the onset of type 1 diabetes leads to lower daily insulin requirements, higher residual β-cell function measured as fasting C-peptide, lower incidence of severe hyopglycemia or diabetic ketoacidosis and a better Quality of Life of children.

Conflict of interest:
Other substantive relationships: This study is an investigator-initiated trial. Equipment is donated by Medtronic International Trading Sàrl.

0529

New results on ADVANCE

J. Chalmers[1], S. Zoungas[2], T. Ninomiya[2], A.P. Kengne[2], Q. Li[3], A. Pillai[3], M. Woodward[1], A. Patel[2]
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[3] *The George Institute for International Health, Statistics, Camperdown, Australia*

Aims: In these new analyses from ADVANCE we examine the risks of clinical outcomes and effects of intensive glucose control by baseline or follow-up clinical characteristics in patients with Type 2 diabetes.
Methods: 11,140 participants were randomised to a gliclazide MR-based intensive glucose control regimen targeting an HbA1c of <=6.5% (n= 5,571) or to standard, guidelines-based glucose control (n=5,569). Effects of the intensive regimen were compared with those of guidelines-based regimens in subgroups defined by baseline or follow-up characteristics. Crude and adjusted risks of clinical outcomes were estimated according to risk factors using Cox proportional hazards models.
Results: Predictors of cardiovascular outcomes included traditional risk factors, as well as albumin-creatinine ratio, atrial fibrillation, HbA1c and duration of diabetes. High urinary albumin levels and low estimated GFR were also independent predictors of both renal and cardiovascular outcomes.
A positive log-linear relationship between clinical outcomes and HbA1c was evident, with 20-25% lower risk of mortality, vascular events and renal events for every 1% lower level of HbA1c during follow-up.
There was no heterogeneity in the effects of intensive glucose control among sub-groups defined by baseline characteristics including HbA1c, age, duration of diabetes, urinary albumin, kidney function and gender. Indeed, treatment effects on major cardiovascular and renal events and mortality proved remarkably consistent.
The results of ongoing analyses on the risks associated with severe hypoglycemia during follow-up will also be presented.
Conclusions: These results from ADVANCE provide new insights into factors predicting risks of complications and confirm the efficacy and safety of the intensive gliclazide MR-based glucose control regimen across a broad range of participant subgroups. They reinforce guideline recommendations that HbA1c be lowered below 7% and to levels as low as 6.5%.

Conflict of interest:
Paid lecturing: Sophia Zoungas, Mark Woodward, Anushka Patel: Servier
Advisory board: John Chalmers: Servier
Other substantive relationships: John Chalmers holds a research grant from Servier as principal investigator for ADVANCE.

ORAL PRESENTATION

Late-breaking abstracts session

O-0530

Mortality related to IFG, IGT and HbA1c: a 6 year follow-up of a high risk screening program, the ADDITION Study – Denmark

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[2] *Steno Diabetes Centre, Research, Gentofte, Denmark*

Background: An international expert group has recently opened a debate regarding the use of HbA1c for the diagnosis of diabetes.
Aim: To compare the distribution and to study the impact on survival of stratification by HbA1c in a population phenotypically at high risk of diabetes.
Method: In a population-based, step-wise screening programme for T2DM in General Practice we identified 25,640 people at high risk for T2DM based on a previously validated diabetes risk score. 19,666 people meet for screening and had HbA1c values and full classification according to WHO criteria. 1,370 with confirmed type 2 diabetes were excluded from the present analysis, as they were included in a randomised trial of early and intensive treatment (the ADDITION study). All individuals were followed from time of screening until death or October 31th 2008, median follow-up time 6,1 years. Excess mortality was estimated using Cox proportional hazard models and all-cause mortality. Hazard Rates (HR) are adjusted for age, sex, BMI, smoking, systolic blood pressure, and stroke, AMI and cancer before screening.
Results: The table shows the distribution and hazard ratio for mortality (HR) by glucose tolerance status, stratified according to the new suggested criteria for diabetes i.e. HbA1c < 6.0%, 6.0-6.4% and >6.4%. People with normal glucose tolerance (NGT) and HbA1c > 6.4% (N=70) as well as people with combined IFG and IGT (N=390) has significant increased mortality compared to people with NGT and HbA1c < 6.0%. The first group is much smaller than the last.

HbA1c <6.0%	HbA1c 6.0–6.4%	HbA1c >6.4%	
N % HR (CI 95%)	N % HR (CI 95%)	N % HR (CI 95%)	N %
14,521 92.8% 1	1,053 6.7% 1.24 (0.9-1.6)	70 0.4% 3.13 (1.6-6.3)	15,644 100%
762 68.5% 1.36 (0.1-1.9)	310 27.9% 0.91 (0.5-1.6)	41 3,7% 1.70 (0.6-5.3)	1,113 100%
372 49.2% 0.95 (0.6-1.7)	342 45.2% 1.33 (0.8-2.1)	42 5.5% 3.79 (1.8-8.2)	756 100%
390 49.8% 2.17 (1.5-3.1)	321 41.0% 1.48 (0.9-2.4)	72 9.2% 2.17 (0.96-4.9)	783 100%
1524 57.5% 1,5 (1.2-1.9)	973 36.7% 1.2 (0.9-1.7)	155 5.8% 2.5 (1.5-4.2)	2,652 100%

Discussion/conclusion: This study shows that elevated HbA1c > 6.4 is associated with increased mortality independent of glucose tolerance status. In individuals with combined IFG and IGT the risk of death was doubled even in those with HbA1c < 6.0 which may stress the need for a global, cardiovascular risk assessment in all individuals phenotypically at high risk of developing diabetes.

No conflict of interest

O-0531

Innovative Measure of Knowledge Associated with Attitudes and Behaviors regarding Reproductive Health in Teens with Diabetes

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Preconception counseling increases women with diabetes' chances of having healthy pregnancies. The ADA recommends, that starting at puberty, preconception counseling should be included in routine clinic visits for all women with diabetes of child-bearing potential. READY-Girls is a preconception counseling program that targets teens with diabetes.
Aims: To examine the level of knowledge regarding diabetes and reproductive health, and its association with: self-efficacy, benefits, and barriers to seeking preconception counseling; perceived severity and risks of pregnancy-related complications; and initiating discussion with health professionals in teen girls (13 -<20 yrs.) with type 1 and 2 diabetes (T1D, T2D).
Method: To begin evaluating the effectiveness of the revised READY-Girls intervention, we developed a comprehensive diabetes specific knowledge measure with 7 subscales confirmed by factor analysis: preconception counseling (14 items); pregnancy (14 items); contraception (2 items); sexuality (4 items); puberty (2 items); general family planning (4 items); and general diabetes (4 items). Questions were multiple choice problem-solving vignettes developed by a mental model technique with groups of expert health professionals and teens with T1D and T2D. Scores can be summed and are based on 100% correctness. Other variables were Likert-type scales and measured using the validated RHATD questionnaire.
In a multisite randomized control trial, a sample of 76 girls were assigned with equal allocation to a standard care group or a treatment group that received the READY-Girls DVD and book over 3 consecutive routine diabetes clinic visits.

Data were collected pre and post intervention at each session. Both groups also received March of Dime pamphlets to read. Presented are data collected pre and post viewing of half the DVD at the first session. The girls' mean age was 15.7 yrs (range 13-19 yrs; 29% ≥ 17), 5% were African American, and 22% had been sexually active.

Results: Baseline mean total knowledge score for the sample was 66.6% (48.8% - 83.7%). Treatment group had significantly higher total, preconception counseling, pregnancy, and sexuality knowledge change scores than controls (7.0 vs. -4.0, 10.6 vs. -3.8, 9.6 vs. -2.7, 22.8 vs. -0.94; p<.001-.016). Change scores for total knowledge were significantly associated with perceived risk of complications (r=-.490; p<.001), severity (r=.397; p=.005), and benefit (r=.318; p=.025).

Conclusion: The proposed knowledge measure demonstrates content and constructs validity. Teens with diabetes lack knowledge regarding diabetes especially with reproductive health. Findings appear to indicate beneficial effects of the READY-Girls program on knowledge and attitudes.

No conflict of interest

O-0532

Needs and desires of diabetes patients regarding communication in Europe: a concept tailored to the desires of patients in Europe

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Diabetes Education and Delivery

The present study evaluated 1500 patients with diabetes regarding medication, education, support, behavioural changes, investment in health care, relationship to all health care system institutions including politics. In addition we investigated the information needs of diabetes patients as well as their attitude towards information received from various interest groups.

70% of the patients reported that the degree of coping with their disease is largely dependent on the degree of information they receive. Diabetes patients seem to have the strongest links to their physicians, the reported level of confidence and support being almost 100%. The remaining groups were significantly less well perceived by patients. Pharmaceutical companies (11%) and politics (1%) were the last in line.

Any provided information for chronic patients must meet high standards and it must provide support in coping with the disease. We have ample evidence that the patients' compliance to treatment as well as their lifestyle behaviour is directly influenced by the extent of information they receive and understand. Besides the doctor the patient is the person with the strongest influence on therapeutic outcome. Consequently patients want to have as much influence on therapeutic decisions as their doctors as clearly stated by 90% of the patients. Patient empowerment is theoretically perceived and desired by most chronic patients. 91% of the chronic patients stated that it is important (31%) or very important (60%) for them to get as much information about prescription drugs as their doctors or pharmacists. Nearly 100% of the patients state that the information they want to receive should be correct, balanced, understandable and supportive and it should be supervised by an independent organisation.

No conflict of interest

O-0533

Identification of novel insulin resistance metabolites in a non-diabetic population by global biochemical profiling

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An unmet medical need is the early identification of insulin resistance (IR) with high accuracy. Our goal was to carry out a global, non-targeted biochemical profiling analysis on human plasma samples to identify novel small molecule metabolites that can distinguish insulin-sensitive from IR subjects in a non-diabetic population. Fasting baseline plasma samples from the EGIR-RISC cohort that were representative of the spectrum of insulin sensitivity and glycemic status, based on hyperinsulinemic euglycemic clamp and oral glucose tolerance testing, were analyzed. Several hundred metabolites were detected and quantified in each sample using UHPLC and GC mass spectrometry-based platforms and proprietary cheminformatics software. Analysis showed that 2-hydroxybutyrate (2-HB), creatine, certain fatty acids and other lipid metabolites such as lysoglycerophosphocholines and acylcarnitines, were the most highly significant metabolites separating insulin-sensitive subjects from IR subjects. Quantitative, targeted mass spectrometric measurements were carried out to confirm the screening results for the IR/IS metabolites. To test their clinical significance, these IR metabolites were further measured in 11 morbidly obese subjects (aged 44±8 years, mean±SD) undergoing bariatric surgery. One year after surgery, BMI had declined from 52±7 to 35±6 kg/m^2 (p<0.001) and the M value had risen from 22±11 to 39±10 μmol·min^{-1}·kg$_{FFM}^{-1}$, (p<0.01). Consistent with 2-HB being a sensitive marker of IR, we observed a 1.7-fold reduction in plasma 2-HB concentrations post-surgery for this obese cohort. The significance of these IR metabolites is discussed in the context of their production in IR states, and their observed changes when insulin sensitivity and energy balance are improved.

Conflict of interest:
Commercially-sponsored research: Collaboration for diagnostic development

O-0534

Gastrointestinal rather than intraislet factors are responsible for diabetic postprandial hyperglucagonaemia

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Aim: In patients with type 2 diabetes mellitus (T2DM), glucagon levels fail to decrease after oral glucose tolerance test (OGTT) while being normally suppressed after isoglycaemic intravenous glucose infusion (IIGI). Inappropriate intraislet inhibition by insulin has been suggested to be responsible. We therefore studied patients with type 1 diabetes mellitus (T1DM) and no residual beta cell function as well as healthy controls (CTRLs) to determine the role of intraislet as opposed to non-pancreatic (gastrointestinal (GI)) mechanisms.

Method: Nine patients with T1DM (age: 25±3 years; body mass index (BMI): 24±1 kg/m^2; HbA_1c: 8.4±0.4%; fasting plasma glucose (FPG): 9.5±0.7 mM (mean±SEM)) and eight healthy control subjects (CTRLs) (age: 28±2 years; BMI: 24±1 kg/m^2; HbA_1c: 5.0±0.1%; FPG: 5.3±0.1 mM (mean±SEM)) were investigated under fasting conditions on two separate occasions: 1) 4-hour 50-g OGTT (+GI stimulation) and 2) IIGI (-GI stimulation). Patients with T1DM took their long-acting insulin the night before investigations, but did not take any insulin in the morning of experimental days.

Results: Isoglycaemia during the two days was obtained in both groups using 53±5 (T1DM) and 30±3 g (CTRLs) of glucose during the IIGIs (p<0.001), resulting in a GI-mediated glucose tolerance (100 % · (($glucose_{OGTT}$(g)-$glucose_{IIGI}$(g)/$glucose_{IIGI}$)) of -6±10 and 67±23% (p<0.01), respectively. The two glucose stimuli resulted in equal glucagon suppression in CTRLs, whereas patients with T1DM exhibited significantly increased glucagon response to OGTT as compared to IIGI (1,519±129 vs. 1,240±86 pM·4h; p=0.03). This difference in glucagon suppression was even more pronounced during the initial 40 min of the two tests with pathologic hypersecretion of glucagon during the OGTT and suppression during the IIGI (27±13 vs. -33±16 pM·40 min; p=0.02).

Conclusion: These results point towards a pivotal role of the GI tract in diabetic postprandial hyperglucagonemia, which seems to be independent of plasma glucose concentration and pancreatic insulin secretion.

No conflict of interest

O-0535

A strategy implementing initial therapy with a fixed-dose combination tablet of sitagliptin and metformin in patients with type 2 diabetes provides superior glycemic control compared with a strategy using initial metformin monotherapy over 44 weeks

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Background and Aim: Initial treatment with combination therapy is an alternative therapeutic strategy that has the potential to achieve and maintain adequate glycemic control in a higher proportion of patients over a longer period of time compared with initial monotherapy followed by add-on therapy. The efficacy and safety of initial therapy with the fixed-dose combination tablet of sitagliptin and metformin (SITA/MET) compared with metformin alone (MET) was assessed over 44 weeks in patients with type 2 diabetes mellitus and inadequate glycemic control (hemoglobin A1c [HbA_{1c}] ≥7.5%) on diet and exercise.

Methods and materials: The double-blind treatment period included an 18-week Phase A and a 26-week Phase B. During Phase A, 1250 patients (mean baseline HbA_{1c} 9.9%) were randomized 1:1 to SITA/MET 50/500 mg BID or MET 500 mg BID, each uptitrated over 4 weeks to SITA/MET 50/1000 mg BID or MET 1000 mg BID, respectively. In Phase A, additional antihyperglycemic agents (AHA) were allowed for patients not meeting progressively stricter glycemic criteria. In Phase B, patients continued their double-blind study medication but, unlike in Phase A, investigators received unmasked HbA_{1c} and FPG results and were to add AHAs as appropriate to achieve glycemic goal per clinical practice.

Results: In this study, AHAs were initiated by the investigator half as often in the SITA/MET group compared with the MET group (8.8% vs. 16.7% of patients, respectively). Over the 44-week treatment period, HbA_{1c} reductions from baseline were -2.3% (95% CI: -2.4, -2.1) for SITA/MET administered as initial therapy and -1.8% (95% CI: -1.9, -1.6) for MET alone administered as initial therapy. The between-group difference of -0.5% favored the SITA/MET group. Fifty percent more patients who initiated treatment with SITA/MET reached the HbA_{1c} goal of <7.0% compared with patients initiating MET alone (46% vs. 30%; p<0.001). Reductions in FPG were also greater in the group initially treated with SITA/MET (-65.0 mg/dL) compared with the MET group (-53.4 mg/dL) (p<0.001). Similar reductions in body weight from baseline were observed in both treatment groups (-1.1 kg SITA/MET; -1.2 kg MET). The incidence of hypoglycemia was low and similar across treatment groups. However, the incidences of abdominal pain and diarrhea were significantly (p <0.05) lower in the SITA/MET group compared with the MET group.

Conclusions: After 44 weeks, a treatment strategy implementing early, aggressive initial combination therapy with SITA/MET in drug-naïve patients provided superior glycemic improvement and a greater proportion of patients achieving HbA_{1c}-goal with similar weight loss, and lower incidences of abdominal pain and diarrhea versus a strategy implementing initial therapy with MET monotherapy.

Conflict of interest:
Stock ownership: T. Seck, D. Williams-Herman, E. Luo, M. Chen, L. Reigle, Y. Ling, W. Taggart, K. Kaufman, B. J. Goldstein
Employee: T. Seck, D. Williams-Herman, E. Luo, M. Chen, L. Reigle, Y. Ling, W. Taggart, K. Kaufman, B. J. Goldstein
Commercially-sponsored research: L. Olansky, C.A. Reasner

O-0536

Dapagliflozin monotherapy in T2DM patients with inadequate glycemic control by diet and exercise: a multicenter phase 3 trial

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Aims: Dapagliflozin selectively inhibits glucose reabsorption through renal sodium-glucose co-transporter 2. We evaluated dapagliflozin monotherapy over 24 wks in drug-naïve T2DM patients.

Methods: This randomized, double-blind, placebo-controlled, parallel-group trial (MB102-013) enrolled T2DM patients, ages 18–77 y, with inadequate glycemic control by diet and exercise. For the primary endpoint, HbA1c change from baseline at Wk 24, 274 patients with enrollment HbA1c 7.0–10.0% were randomized to placebo (PBO), dapagliflozin 2.5, 5 or 10 mg each morning. Key secondary endpoints included changes in FPG and body weight. Exploratory analyses included HbA1c, FPG, and weight changes in 74 patients with enrollment HbA1c 10.1-12.0%, who were randomized to dapagliflozin 5 or 10 mg.

Results: At Wk 24, dapagliflozin groups with enrollment HbA1c 7.0-10.0% showed mean reductions from baseline in HbA1c and FPG, those with 5 and 10 mg being statistically significant (Table). Mean weight decreases were greater with dapagliflozin than PBO, but did not reach statistical significance. For patients with enrollment HbA1c 10.1–12.0%, mean changes from baseline at Wk 24 included HbA1c: –2.88% (5 mg), –2.66% (10 mg); FPG: –77 mg/dL (5 mg), –84 mg/dL (10 mg); and weight: –2.1 kg (5 mg), –1.9 kg (10 mg). Adverse events were generally balanced across groups, with no related deaths or related serious adverse events. Rates of hypoglycemia and hypotension/dehydration/hypovolemia were similar among PBO and dapagliflozin arms. There were no clinically relevant mean changes from baseline in creatinine or electrolytes. Small, dose-related increases in hematocrit were observed with dapagliflozin. The incidence of urinary tract infections was: PBO, 3 (4.0%); dapagliflozin 2.5 mg, 3 (4.6%); 5 mg, 8 (12.5%); 10 mg, 4 (5.7%); the incidence of genital infections was: PBO, 1 (1.3%); dapagliflozin 2.5 mg, 5 (7.7%); 5 mg, 5 (7.8%); 10 mg, 9 (12.9%).

Conclusion: At Wk 24, dapagliflozin monotherapy produced clinically meaningful decreases in HbA1c and FPG and appeared to be generally safe and well tolerated.

See table 1

Conflict of interest:
Stock ownership: James F. List, Bristol-Myers Squibb.
Advisory board: Ele Ferrannini, Bristol-Myers Squibb.
Employee: Weihua Tang, Bristol-Myers Squibb. Afshin Salsali, Bristol-Myers Squibb. James F. List, Bristol-Myers Squibb.
Commercially-sponsored research: Silvia Jimenez Ramos, Bristol-Myers Squibb/AstraZeneca. Weihua Tang, employee of study sponsor Bristol-Myers Squibb. Afshin Salsali, employee of study sponsor Bristol-Myers Squibb. James F. List, employee of study sponsor Bristol-Myers Squibb.
Other substantive relationships: Ele Ferrannini, consultancy honoraria, Bristol-Myers Squibb. James F. List, patent author (Methods for Treating Obesity Employing an SGLT2 Inhibitor and Compositions Thereof. US20080234367 A1 all rights owned by Bristol-Myers Squibb).

table 1

Efficacy Assessment (Last Observation Carried Forward, Excluding Data After Rescue)				
Patients with Enrollment HbA1c 7.0-10.0%	**PBO [n=75]**	**Dapagliflozin**		
		2.5 mg [n=65]	**5 mg [n=64]**	**10 mg [n=70]**
HbA1c (%), baseline mean (SD)	7.79 (0.83)	7.91 (0.89)	7.83 (0.92)	8.01 (0.95)
HbA1c change at Wk 24, adjusted mean (SE)	–0.23 (0.10)	–0.58 (0.11)	–0.77 (0.11)*	–0.89 (0.11)*
FPG (mg/dL), baseline mean (SD)	160 (42)	164 (48)	157 (35)	167 (41)
FPG change at Wk 24, adjusted mean (SE)	–4 (4)	–15 (4)	–24 (4)*	–29 (4)*
Weight (kg), baseline mean (SD)	88.8 (19.0)	90.8 (22.8)	87.2 (16.1)	94.1 (18.8)
Weight change at Wk 24, adjusted mean (SE)	–2.2 (0.43)	–3.3 (0.46)	–2.8 (0.47)	–3.2 (0.45)
*p≤0.001 vs PBO				

O-0537

Piragliatin, an allosteric activator of glucokinase, greatly enhances glucose-induced pancreatic islet respiration and insulin release

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The recent discovery of drugs that directly stimulate glucokinase (GK) enzymatic activity is a remarkable development with great promise for the treatment of patients with type 2 diabetes mellitus. These GK activators (GKAs) are mixed-type, nonessential activators of the enzyme lowering the glucose $S_{0.5}$ and increasing the k_{cat} at < 1μM. It was previously shown that the GKA piragliatin (RO4389620, US patent 2007115968, Hoffman-La Roche) lowers the threshold for glucose stimulated insulin release (GSIR) in isolated rat and mouse islets. Piragliatin potentiates GSIR and lowers blood sugar following oral administration to normal and diabetic rodents as well as humans. In the present study we emphasized the effect of piragliatin on mouse islet respiration as the most basic parameter of beta-cell function using a novel optical method based on metalloporphyrin phosphorescence quenching by oxygen. These data are supplemented with insulin release measurements, glucose usage and oxidation data and changes in intracellular Ca^{2+} concentration. Perhaps the most striking result is the effect of different concentrations of piragliatin on GSIR and the respiratory response of isolated cultured mouse islets to a "staircase" stimulus with glucose from zero to 3, to 6, to 12 and then to 24 mM. All concentrations of piragliatin (1, 3, 10 and 30 μM) greatly left-shifted the glucose-dependency curve of O_2 use and GSIR and slightly elevated V_{max} at >1 μM. At 10 and 30 μM of the drug, 3 mM glucose caused maximal stimulation of respiration whereas at lower drug concentrations (1 and 3 μM) 6 and 12 mM glucose augmented respiration further. In contrast to enhancement of insulin secretion, 24 mM glucose was ineffective to stimulate oxygen consumption in all cases, even in untreated mouse islets, suggesting a contribution of glycolytic ATP to stimulation of secretion. Additional experiments confirmed that these effects were due to an increase in glucose usage and oxidation and were consistent with changes in the concentration of free intracellular Ca^{2+}. In summary, piragliatin greatly augmented GSIR, glucose induced respiration, glycolysis and glucose oxidation characterized by a left shift of all glucose concentration dependency curves with little change of the maximal effects. These studies provide critical mechanistic data on piragliatin action and demonstrate the potential of GKAs for improving insulin secretion and glucose metabolism in patients with type 2 diabetes.

Conflict of interest:
Stock ownership: Grimsby, Joseph ADRs stock
Employee: Hoffmann-La Roche

SYMPOSIUM

CLINICAL RESEARCH

Inflammation and diabetes

0538

Innate immunity in insulin resistance and type 2 diabetes: causes and consequences

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While it is well appreciated that modern lifestyles and obesity promote insulin resistance, type 2 diabetes (T2D), and associated co-morbidities including atherosclerosis and fatty liver disease, detailed molecular and cellular causes are unresolved. Inflammation of visceral fat is a leading hypothesis, as assessed by changes in leukocyte numbers and the excessive production of an array of cytokines and adipokines. Our lab has been especially interested in identifying initiators of inflammation in adipose tissue and potential avenues for suppressing chronic inflammation as a way of diminishing insulin resistance and risk for T2D and associated co-morbidities. Our pioneering studies with salicylates provide a proof-of-principle that the targeting of inflammation can have a positive impact on metabolic and cardiovascular health and pathology. Much of our recent work with preclinical animal models looks at relative roles of non-immune tissues vs. the immune system, including both circulating and tissue resident leukocyte subtypes. For example, recent unpublished findings show that circulating leukocytes are affected by obesity, and this primes certain leukocytes (e.g. Ly6C+ monocytes) for entry into adipose tissue; at the same time other leukocytes (e.g. T regulatory cells, Tregs) appear to exit adipose tissue as obesity progresses. Anti-inflammatory drugs including salicylates reverse some of these trends in parallel with reversing insulin resistance.

Conflict of interest:
Paid lecturing: Merck
Advisory board: Amylin, Metabolex, Syndexa, Catabasis

0539

Clinical trials of anti-inflammatory agents

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Chronic inflammation mediated by NF-κB may participate in the pathogenesis of T2D. Salicylates inhibit NF-κB activity. We therefore evaluated salsalate, a non-acetylated prodrug of salicylate, for safety and efficacy in glycemic control and other metabolic parameters in patients with T2D.
TINSAL-T2D is an NIH-sponsored, multicenter, placebo lead-in, randomized double-masked, dose ranging placebo controlled trial; 108 patients aged 18-75 years having HbA1c values of 7.0-9.5% were randomized at 17 sites in the USA to receive salsalate (3.0, 3.5 or 4.0 g/d tid) or placebo for 14 weeks as an add-on to current therapy.
Treatment and control groups were of similar age (56 yr), BMI (34 kg/m^2), gender (58% male), ethnicity, current treatment, and baseline HbA1c (7.7%). For our primary endpoint, all doses of salsalate lowered HbA1c by 0.5% ($p<0.01$). Each dose also decreased mean fasting glucose (27-32 mg/dL) and triglyceride (31-49 mg/dL), and increased mean adiponectin (1.7-2.8 μg/ml) concentrations, compared to placebo. Mild hypoglycemia, which was more common in the treatment groups, was documented only in patients taking concomitant sulfonylurea. Reductions in concomitant diabetes medications were required in the treatment groups, ***vs.*** increases in the placebo group, for safety. No drug related serious adverse events occurred. Salsalate was well tolerated with high mean adherence rates (94-98%), although tinnitus was more prevalent in the treatment arms (20% ***vs.*** 11% placebo).
Salsalate improves glycemia and other metabolic parameters in patients with T2D and may provide an effective, safe and inexpensive new avenue for diabetes treatment. A larger pivotal trial comparing placebo and 3.5 g/d salsalate has been initiated to further establish this concept.
NCT00392678, U01 DK074556

Conflict of interest:
Other substantive relationships: The trial was investigator initiated. Caraco Pharmaceutical provided salsalate and placebo. Lifescan, a division of Johnson and Johnson, provided home glucose monitoring supplies. Mercodia provided assay materials.

0540

Islet inflammation and treatment of type 2 diabetes with IL-1 antagonists

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Islets of patients with type 2 diabetes have the feature of an inflammatory process reflected by the presence of cytokines, immune cells, β-cell apoptosis, amyloid deposits and fibrosis. Indeed, β-cells from patients with type 2 diabetes display inflammatory markers including increased interleukin-1β expression and decreased IL-1 receptor antagonist. Furthermore, increased islet-associated macrophages are observed in human type 2 diabetic patients. These immune cells are most likely attracted by islet-derived chemokines, produced in response to metabolic stress, and under the control of IL-1β. There is also increasing clinical evidence that points to the role of elevated IL-1β in β-cell failure in patients with type 2 diabetes. Recent clinical studies using an IL-1 receptor antagonist and an anti-IL-1β antibody have shown improved glycemic control and β-cell function. Therefore IL-1 antagonism appears as a new therapeutic approach to type 2 diabetes by targeting the master inflammatory cytokine triggering damage to insulin producing β-cells. It follows

that modulation of intra-islet inflammatory mediators, in particular IL-1β, may prevent insulitis in type 2 diabetes and therefore presents itself as a possible causal therapy with disease-modifying potential.

Conflict of interest:
Advisory board: Amgen, AstraZeneca, Novartis, Merck, Novo Nordisk, XOMA
Commercially-sponsored research: Cytos, Novo Nordisk, XOMA

0541

Inflammation and CVD

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Low grade inflammation has been linked to the development of atherosclerosis and cardiovascular disease (CVD) events. Inflammation is also associated with the development of diabetes, and obesity may be a trigger for stimulation of the inflammatory cascade.
Early in the process, adhesion molecules from the endothelium attract monocytes and enhance their migration into the vessel wall, where they interact with oxidized lipids to form foam cells. Late in the process, inflammation in plaque leads to its rupture and thrombotic events. A wide variety of inflammatory markers can be measured in circulation and the vessel wall, and are increased in diabetes, obesity and CVD. Of these, C-reactive protein can be easily measured in clinical practice and may help in risk stratification in some patients. Nuclear factor kappa B (NFkB) is a transcription factor that may be the "master switch" initiating this process, and is an attractive therapeutic target. Several drugs used in diabetes and CVD modulate the actions of this factor.
Proof that inflammation is a key process in CVD requires that its suppression will lead to a decrease in CVD events. In the Jupiter trial, patients were selected on the basis of moderate cholesterol levels but elevated hsCRP indicating low grade inflammation – often associated with obesity. In such patients treatment with rosuvastatin significantly decreased CVD events. However, it is unclear whether the benefit was obtained by inflammation suppression alone, since LDL cholesterol decreased with the treatment. The TINSAL –CVD trial is using an anti-inflammatory agent which does not lower LDL and will test this hypothesis further.

Conflict of interest:
Paid lecturing: Glaxo Smith Kline, Novo Nordisk, Sanofi Aventis, Daiichi Sankyo
Advisory board: Glaxo Smith Kline, Novo Nordisk, Sanofi Aventis, Daiichi Sankyo, Novartis, Eli Lilly, Astra Zeneca
Employee: Glaxo Smith Kline, Novo Nordisk, Sanofi Aventis, Daiichi Sankyo, Novartis, Eli Lilly

ORAL PRESENTATION

Incretin therapies in clinical practice

O-0542

Reductions in lipids and CV risk markers in patients with type 2 diabetes treated with liraglutide: a meta-analysis

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Aims: Patients with T2D have abnormalities in their lipid/CV biomarker profiles that are associated with increased CV risk. In a series of phase 3 randomised controlled trials (LEAD: Liraglutide Effect and Action in Diabetes), treatment with the human GLP-1 analogue liraglutide OD improved HbA_{1c} (1.0–1.5%), produced sustained weight reductions (2–3 kg), and reduced SBP (2–6 mmHg). We assessed the impact of liraglutide on lipids and other CV risk markers.
Methods: We conducted a meta-analysis (ANCOVA) of the six trials comparing liraglutide 1.8 mg OD with common T2D therapies (glimepiride [glim], rosiglitazone [rosi], insulin glargine, exenatide) and placebo (n=3967).
Results: After 26 weeks, TC, LDL, FFA and TG levels all decreased significantly from baseline with liraglutide ($p<0.01$ for all) (Table). Decrease in TC was significantly greater with liraglutide ($p<0.01$) than with rosi, glargine or placebo; decrease in LDL was significantly greater with liraglutide ($p<0.05$) than with rosi, glim, or glargine. Compared with baseline, HDL fell significantly with all interventions except rosi. Versus baseline, liraglutide significantly decreased levels of BNP and hsCRP – 2 key biomarkers of CV risk ($p<0.01$). ApoB levels did not change significantly with any treatments.
Conclusion: Liraglutide significantly improved the lipid profile, and reduced BNP and hsCRP levels, in T2D patients over 26 weeks. Liraglutide may have potential CV benefits in T2D in addition to its documented effects on glycaemic control, weight and SBP.

	Lira-glutide	Rosigli-tazone	Glime-piride	Glargine	Exena-tide	Placebo
n[a]	1363	896	231	490	231	524
CV risk markers	**Relative change (%)**					
Brain natriuretic peptide (BNP)[b]	-11.9**	30.9***	0.1	10.2	-3.9	1.4
High sensitivity C reactive protein (hsCRP)[b]	-23.1***	-42.6***	-12.3*	2.8	-15.6*	-3.0
Apo B (%)[c]	-0.7	1.8	1.6	3.1	2.0	2.9
Lipids	**Change (mmol/L)**					
Total cholesterol (TC)	-0.13**	0.29**	-0.05	0.02	-0.05	0.01
Low density lipoprotein (LDL)	-0.20***	0.06	-0.12*	-0.07	-0.15*	-0.13*
Very low density lipoprotein (VLDL)	0.10**	0.22***	0.12**	0.12**	0.16**	0.16***
High density lipoprotein (HDL)	-0.04***	0.02	-0.04**	-0.04**	-0.05**	-0.03*
Free fatty acids (FFA)[d]	-0.09***	-	-0.05**	-	-0.03	-0.06*
Triglycerides (TG)	-0.20**	-0.05	-0.16	-0.15	-0.05	0.02

[a]n values show all patients in each group. For each parameter, only available data were analysed. Meta-analysis of LEAD 1–6, except as follows: [b]LEAD 1,2, 4–6; [c]LEAD 1–3, 5, 6; [d]LEAD 2,3,6.*p<0.05 **p<0.01 ***p<0.0001 vs baseline.

Conflict of interest:
Paid lecturing: Garber: Novo Nordisk
Advisory board: Garber: Novo Nordisk
Employee: Falahati, Toft: Novo Nordisk
Other substantive relationships: Plutzky, Garber Novo Nordisk (consultant)

O-0543

Effect of LY2189265, a long-acting glucagon-like peptide 1 analog, on metabolic outcomes and GI events in obese patients with uncontrolled type 2 diabetes mellitus (T2DM): The EGO study.

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Aims: LY2189265, a novel, long-acting glucagon-like peptide 1 (GLP-1) analog, consists of a DPP-IV-protected GLP-1 analog covalently linked to a human IgG4-Fc heavy chain by a small peptide linker. The aim of this phase 2, randomized, placebo-controlled, double-blind study was to investigate the effect of once-weekly LY2189265 on metabolic outcomes and adverse event profiles over 16 weeks in overweight/obese T2DM patients.
Methods: Patients were randomized to once-weekly subcutaneous injections of either placebo or one of 3 LY2189265 dose regimens: 1.0 mg, 16 weeks; 0.5 mg, 4 weeks then 1.0 mg, 12 weeks; or 1.0 mg, 4 weeks then 2.0 mg, 12 weeks. At randomization, patients were taking stable (> 3 months) doses of oral anti-hyperglycemic agents from any 2 of 4 drug classes (sulphonylurea, biguanide, thiazolidinedione, DPP-IV inhibitor). The primary metabolic outcome was change from baseline at 16 weeks in HbA_{1c}. Secondary measures were body weight, solid mixed meal test post-prandial glucose (PPG) and PPG excursion. Treatment emergent adverse events (TEAEs) were recorded at each visit.
Results: Baseline characteristics for randomized patients (n=262; 49% female; mean T2DM 8.3 years; mean BMI 33.9 kg/m^2; and mean HbA_{1c} 8.2%) were not different between treatment groups. Compared to placebo, statistically significant improvements were observed in all metabolic outcomes after treatment with LY2189265, as shown in the following table:

Metabolic Outcome (units)	Placebo	LY2189265		
		0.5/1.0 mg	1.0/1.0 mg	1.0/2.0 mg
Change in HbA_{1c} (%), LSMean	-0.3	-1.3*	-1.3*	-1.5*
Change in weight (kg), LSMean	-0.1	-1.6*	-1.4*	-2.5*
Test Meal PPG AUC, mean	36.4	30.7*	32.2*	28.2*
Test Meal PPG AUC Excursion, mean	10.9	8.9*	9.9*	8.2*

*p<0.05 vs placebo; AUC, area under the curve

The overall incidence of patients with hypoglycemic episodes was not significantly different across the treatment groups (overall p=0.85), although episodes were numerically more frequent in the LY2189265 treated groups. LY2189265 was generally well tolerated and there was no statistically significant difference between groups for nausea (all treatments: 13.0%, p=0.43), diarrhea (8.8%, p=0.45) or abdominal distension (8.0%, p=0.26), which were the most frequently recorded TEAEs.

Conclusions: In conclusion, adjunctive administration of once-weekly LY2189265 in patients with T2DM sub-optimally controlled by OAHs resulted in significant reductions in HbA_{1c}, body weight and AUC for postprandial glucose and glucose excursion.

Conflict of interest:
Paid lecturing: T Blevins J Rosenstock- Eli Lilly and Company
Stock ownership: E Bastyr, C Cheng and J Anderson- Eli Lilly and Company
Advisory board: T Blevins J Rosenstock- Eli Lilly and Company
Employee: C Cheng, E Bastyr and J Anderson- Eli Lilly and Company
Commercially-sponsored research: T Blevins J Rosenstock- Eli Lilly and Company

O-0544

Exenatide once-weekly versus twice-daily: comparison of diurnal and postprandial glucose patterns using continuous glucose monitoring and ambulatory glucose profile analysis

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Aims: Our aim was to employ continuous glucose monitoring (CGM), for the first time, to graphically and statistically represent diurnal glucose patterns produced by administration of exenatide once-weekly or twice daily to compare their impact on glucose exposure, variability and stability.

Methods: Progressive loss of GLP-1 is a major underlying defect associated with type 2 diabetes. Exenatide, a synthetic duplicate of exendin-4 with prolonged action, injected twice daily before meals has been used to respond to postprandial hyperglycemia. An extended action formulation of exenatide administered by injection once each week is under investigation. Exenatide once-weekly consists of biodegradable polymeric microspheres composed of exenatide with a stabilizer incorporated into a matrix of poly (D, L-lactide-co-glycolide). Subjects with type 2 treated with oral agents or insulin were administered either exenatide once-weekly or exenatide twice-daily for a period of up to six months. CGM was employed to characterize diurnal glucose patterns at baseline and after stabilization with exenatide. Ambulatory glucose profile analysis (AGP) was used to graphically and statistically represent glucose exposure, variability and stability. Area under the median curve was used to measure diurnal glucose exposure; inter-quartile range was employed to characterize variability and; average absolute hourly rate of change between consecutive CGM values represented stability. Additional study endpoints were HbA_{1c} and weight.

Results: Sixteen patients participated in the study (9 exenatide twice-daily/7 exenatide once-weekly). There was no significant difference in entry age (~61 years), BMI (~34kg/m2) or HbA_{1c} (~8.3%) between cohorts. Summarized in the table below are the changes in glucose exposure, variability and stability from baseline to study end. There was no significant difference between the improvements found in both groups. HbA_{1c} decreased by an average 1% point in the exenatide once-weekly group versus 0.7 % points in the twice-daily cohort (NS). Weight lowered by an average 4 kilograms in both groups.

See table 1

Conclusions: Once-weekly and twice daily formulations of exenatide were equally effective in reducing overall glucose exposure and variability while improving glucose stability.

Conflict of interest:
Commercially-sponsored research: Investigator initiated research project sponsored by Amylin and Lilly

O-0545

Weekly, biweekly, and monthly albiglutide improves measures of glycemia in patients with type 2 diabetes on background metformin therapy

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Aims: Combination therapy for type 2 diabetes mellitus (T2DM) often involves adding a second agent to metformin. This study examined the effects of dose and schedule of albiglutide, a GLP-1-receptor agonist, on glycemic response, which included an exenatide arm to provide clinical perspective. Several doses and timing schedules were examined for albiglutide efficacy in the whole population and in a subgroup of subjects on background metformin to more directly compare effects with exenatide.

Methods: 356 subjects (mean age 54, BMI 32.1kg/m^2) with T2DM (mean duration 5 years) inadequately controlled with diet/exercise or metformin (mean baseline HbA_{1c} 8.0%) received subcutaneous placebo, albiglutide [weekly (4, 15 or 30mg), every other week (biweekly; 15, 30 or 50mg) or monthly (50 or 100mg)] or non-blinded exenatide (bid, per label) over 16 weeks in this randomized, double-blind, parallel-group, Phase 2 study. The metformin subanalysis included 245 subjects (mean HbA_{1c} 7.82–8.10%).

table 1

	Baseline Exposure (mg-24hrs/dL)	End Exposure (mg-24hrs/dL	Baseline Variability (mg/dL)	End Variability (mg/dL)	Baseline Stability (mg/dL/hr)	End Stability (mg/dL/hr)
Exenatide Wkly	4027±643	3376±491	56±14	47±8	10±4	8±3
Exenatide Daily	3905±1261	3450±955	48±17	45±20	9±8	7±3

table 2

		Albiglutide Weekly			Albiglutide Biweekly			Albiglutide Monthly	
HbA_{1c} for Metformin Group	Exenatide n=34	4mg n=22	15mg n=25	30mg n=21	15mg n=21	30mg n=21	50mg n=22	50mg n=24	100mg n=22
Baseline HbA_{1c}	7.99	8.26	8.01	8.06	8.04	8.01	7.98	7.99	8.10
Week 16 change from baseline	-0.54	-0.31	-0.38	-0.78	-0.43	-0.75	-0.83	-0.45	-0.77
Week 16 change from placebo (treatment effect estimate; LS mean)	-0.48*	-0.09	-0.23	-0.61*	-0.24	-0.61*	-0.70*	-0.32	-0.62*
HbA_{1c} for Overall Population	n=34	n=34	n=34	n=29	n=30	n=32	n=34	n=35	n=33
Baseline HbA_{1c}	7.99	8.15	8.00	8.01	8.17	7.96	7.91	7.92	8.06
Week 16 change from baseline	-0.54	-0.11	-0.49	-0.87	-0.56	-0.79	-0.79	-0.55	-0.87
Week 16 change from placebo (treatment effect estimate; LS mean)	--	+0.20	-0.26	-0.62*	-0.22	-0.55*	-0.57*	-0.34	-0.60*
*p<0.05									

Results: Across albiglutide groups and placebo, 66–74% received metformin. At 16 weeks, FPG reductions of -1.26, -2.10, -1.80, and -0.07mmol/L for the 30mg weekly, 50mg biweekly, and 100mg monthly doses of albiglutide and placebo, respectively, were obtained for the metformin subgroup, vs -1.44, -1.32, -1.22, and -0.10mmol/L, respectively, for the overall population. Exenatide decreased FPG by -0.80mmol/L. In metformin patients, the highest albiglutide doses in each treatment schedule significantly reduced HbA_{1c} over 16 weeks: -0.78%, 30mg weekly; -0.83%, 50mg biweekly; and -0.77%, 100mg monthly vs placebo (-0.05%, $p<0.05$); exenatide reduced HbA_{1c} by -0.54%. In the overall population, HbA_{1c} was reduced -0.87, -0.79 and -0.87% by 30mg weekly, 50mg biweekly and 100mg monthly albiglutide dosing, respectively, vs placebo (-0.17%, $p<0.005$). Weight loss with albiglutide ranged from 0.4–2.1kg with metformin and 0.9–1.8kg in the overall population.

See table 2 (page 181)

HbA_{1c}<7% was achieved by 43%, 50%, and 46% of subjects on metformin who received 30mg weekly, 50mg biweekly, and 100mg monthly albiglutide, respectively, vs 15% with placebo and 35% in the exenatide group.
Conclusion: Albiglutide was effective in subjects receiving background metformin and provided numerically greater HbA_{1c} and FPG reductions than exenatide.

Conflict of interest:
Stock ownership: M. Stewart - GlaxoSmithKline M. Bush - GlaxoSmithKline F. Yang - GlaxoSmithKline
Advisory board: J. Rosenstock - Pfizer, Roche, Sanofi-Aventis, Novo Nordisk, Eli Lilly, MannKind, GlaxoSmithKline, Takeda, Daiichi Sankyo, Centocor, Johnson & Johnson, Emisphere, Novartis and Amylin
Employee: M. Stewart – GlaxoSmithKline M. Bush – GlaxoSmithKline F. Yang - GlaxoSmithKline
Commercially-sponsored research: J. Reusch - GlaxoSmithKline, Takeda, Merck, MannKind
Other substantive relationships: J. Rosenstock - Merck, Pfizer, Sanofi-Aventis, Novo Nordisk, Bristol-Myers Squibb, Eli Lilly, GlaxoSmithKline, Takeda, Novartis, AstraZeneca, Amylin, Johnson & Johnson, Daiichi Sankyo and MannKind J. Reusch - GlaxoSmithKline, Takeda, Amylin, Merck

O-0546

Prediction of the glycaemic lowering effect of incretin mimetics prior to therapeutic application

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Background and aims: Incretin mimetics are a new class of antihyperglycaemic agents that have the possibility to improve glycaemic control similar to natural incretin hormones. Exenatide, the first incretin mimetic on the market, mediates the re-establishment of glucose-dependent insulin secretion, suppression of elevated postprandial glucagon secretion, and slowing of gastric emptying. Initial application of Exenatide has also demonstrated that some patients meet the expected effects on glycaemic control but others failed. At present, no pre-clinical method predicting low or high Exenatide responders is available. It was therefore the aim of this project to develop and to verify a method allowing identification of low or high responders prior to the therapeutic application of incretin mimetics.
Materials and methods: The Karlsburg Diabetes-Management System KADIS® was used to develop an ***in silico*** method for outcome prediction of therapeutic application of the incretin mimetic Exenatide. For this purpose, KADIS® was adapted to the special requirements. The modified KADIS®-supported program comprises: (1) continuous glucose monitoring (CGM) which was performed first in each study patient; (2) KADIS®-based identification of the current individual metabolic situation; (3) ***in silico*** testing of the metabolic effect of the application of 20µg Exenatide on the 24-h glycaemic pattern; (4) estimation of an Exenatide equivalence factor by replacing ***in silico*** Exenatide by a long acting insulin and titration of the insulin dose required to achieve the same blood glucose lowering effect as Exenatide; (5) relating the patients to high or low responders according to the estimated Exenatide equivalence factor of insulin action. To verify the proposed procedure, 58 non-insulin treated type 2 diabetic patients were involved into the study.
Results: The overall glycaemic lowering effect of 20µg Exenatide was estimated to be 0.81$\pm$ 0.50 mmol/l and equals an insulin dose of 12.6 $\pm$4.8 IU. 41% of the study patients could be identified to be high responders (equivalence factor of insulin action >12.6 IU) to an Exenatide therapy and 59% were low responders (equivalence factor of insulin action <12.6 IU). In the group of high responders the mean daily glucose pattern (MBG) dropped down by 1.15 $\pm$0.57 mmol/l which equals an insulin dose of 17.2 $\pm$3.2 IU, whereas in the group of low responders the MBG dropped down by 0.57 $\pm$0.23 mmol/l which equals an insulin effect of 9.3 $\pm$2.6 IU. In the group of high responders to an Exenatide therapy a higher BMI (31.4 vs. 28.5 kg/m^2), an enhanced endogenous insulin supply (62.2 vs. 49.7 IU/day), and a higher HbA1c (6.7 vs. 6.2%) was observed at baseline.
Conclusions: The metabolic effect of an Exenatide therapy can be predicted prior to therapeutic application by using CGM in combination with KADIS®-based in silico simulation strategy.

No conflict of interest

O-0547

Twelve weeks treatment with the DPP-4 inhibitor, sitagliptin, does not induce feedback inhibition on incretin secretion and does not alter somatostatin secretion in patients with type 2 diabetes – a randomized trial

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Increased levels of intact glucose-dependent insulinotropic polypeptide (GIP) and glucagon-like peptide 1 (GLP-1) from acute dipeptidyl peptidase-4 (DPP-4) inhibition have been shown to induce feedback inhibition on incretin secretion. Furthermore, somatostatin secretion is known to be stimulated by GLP-1, which may possibly be enhanced by DPP-4 inhibition. Whether these effects occur during long-term treatment with a DPP-4 inhibitor in subjects with type 2 diabetes (T2DM) is unknown.
A double-blinded, placebo-controlled study was performed over 12 weeks, in which 24 patients with T2DM were randomized to receive either sitagliptin (Januvia®) 100 mg qd or placebo as add-on therapy to ongoing treatment with metformin (=1000mg). In week 0, 1, and 12, subjects were examined with a 240 min standardized meal test (2,370 KJ). Somatostatin, intact and total GLP-1 and GIP responses were calculated as the area under the meal test response curves (AUC).
22 subjects (sitagliptin n=12, mean age 60 years, mean HbA_{1c} 8.3%; placebo n=10, mean age 61 years, mean HbA_{1c} 7.6%) were included in the post-study analysis. Two subjects originally randomized to placebo were excluded due to a deliberate 12% body weight loss. From week 0 to week 1, sitagliptin increased the levels of intact GIP 2-fold (p=0.002) and intact GLP-1 3-fold (p=0.003). In week 12, levels of intact GIP remained elevated, whereas intact GLP-1 did not (p=0.6, week 0 ***vs*** week 12). The increases in intact GLP-1 and GIP in week 1 were significantly different from the changes in the placebo group (both p<0.001). Sitagliptin had no effect on the levels of total GLP-1 (p=0.2), total GIP (p=0.3), or somatostatin (p=0.9). There were no significant changes in the placebo group.
Twelve weeks treatment with sitagliptin in subjects with T2DM does not seem to alter plasma levels of total GLP-1, total GIP, or somatostatin. Thus, the negative feedback observed during acute DPP-4 inhibitor treatment may not occur during prolonged DPP-4 inhibitor treatment in subjects with T2DM, and increased levels of intact GLP-1 do not seem to increase the peripheral plasma concentration of somatostatin.

Conflict of interest:
Paid lecturing: Aaboe, Knop, Vilsbøll, Deacon, Holst, Madsbad, Krarup Merck and Co, Inc
Advisory board: Vilsbøll, Holst, Madsbad, Krarup Merck and Co, Inc
Other substantive relationships: Deacon, spousal relationship Merck and Co, Inc.

O-0548

Combination alogliptin plus pioglitazone treatment in patients with type 2 diabetes inadequately controlled with diet and exercise

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Aims: Initial combination therapy is an emerging strategy to address the multifactorial nature of T2DM from the outset of disease. This study investigated the efficacy and tolerability of initial combination therapy with the DPP-4 inhibitor, alogliptin (ALO), which improves islet cell function, and the TZD pioglitazone (PIO), which reduces insulin resistance.
Methods: In this randomized, double-blind study, two doses of ALO in combination with PIO were compared with ALO alone and PIO alone in patients with T2DM inadequately controlled with diet and exercise (A1C 7.5%-11%). Subjects received ALO 25 mg/d, PIO 30 mg/d, or combination ALO 12.5 + PIO 30 mg/d or ALO 25 + PIO 30 mg/d.
Results: Baseline characteristics were similar between groups (N=655; mean age 53 yrs; diabetes duration 3.2 yrs; A1C 8.8%; fasting plasma glucose (FPG) 191 mg/dL; BMI 31 kg/m^2). Greater improvements in the least-squares (LS) mean change from baseline A1C were observed in the ALO 25 + PIO (-1.71%) vs either ALO (-0.96%) or PIO (-1.15%) (P<0.001) and for ALO 12.5 + PIO (-1.56%) vs PIO (P<0.001) groups. Compared with the monotherapy groups, a significantly (P<0.01) higher percentage of subjects achieved >/=1.0% and >/=1.5% A1C decreases on the ALO 25 + PIO 30 combination (Table). The changes from baseline in LS mean insulin resistance (HOMA IR) at Week 26 were -1.4, -3.4, -3.5, and -3.6 for the A25 alone, P30 alone, A12.5 + P30, and A25 + P30 groups, respectively, indicating a preserved insulin sensitizing effect of PIO when it was coadministered with either dose of ALO. Moreover, subjects receiving either ALO 12.5 + PIO 30 or ALO 25 + PIO 30 also had improvements in HOMA beta-cell function vs subjects receiving either A25 alone or P30 alone; LS mean changes from baseline at Week 26 were 10.5, 17.5, 24.9, and 39.2 for the A25 alone, P30 alone, A12.5 + P30, and A25 + P30 groups, respectively. Hypoglycemia was rare, with no incidences of severe hypoglycemia reported.
Conclusions: These results suggest improved glycemic efficacy due to persistent reduction of insulin resistance and added improvement of pancreatic beta-cell function of an initial combination therapy with ALO + PIO over that of either monotherapy component. Initial improvement of glycemia by these synergistic modes of action may help to provide glycemic durability in the long term.

Table: Clinical Response at Week 26

	ALO 25 mg	PIO 30 mg	ALO 12.5 mg/ PIO 30 mg	ALO 25 mg/ PIO 30 mg
A1C Change from baseline Baseline A1C <9.0% Comparison vs P30 alone Comparison vs A25 alone	-0.77% (n=97)	-1.00% (n=92)	-1.33% (n=92) *P*=0.005	-1.30% (n=93) *P*=0.009 *P*<0.001
Baseline A1C >/=9.0% Comparison vs P30 alone Comparison vs A25 alone	-1.20% (n=63)	-1.38% (n=61)	-1.91% (n=66) *P*=0.020	-2.30% (n=65) *P*<0.001 *P*<0.001
A1C decrease >/=1% *P*-value vs PIO 30 *P*-value vs ALO 25	43% (n=71)	55% (n=89)	68% (n=111) *P*<0.05	76% (n=124) *P*<0.001 *P*<0.001
A1C decrease >/=1.5% *P*-value vs PIO 30 *P*-value vs ALO 25	29% (n=48)	33% (n=54)	51% (n=83) *P*<0.01	57% (n=94) *P*<0.001 *P*<0.001

Conflict of interest:
Paid lecturing: Inzucchi: Merck & Co., Novartis Pharmaceuticals, Takeda Pharmaceuticals
Stock ownership: Mekki: Takeda Pharmaceutical Company, Ltd.
Employee: Fleck, Mekki, and Wilson: Takeda Global Research & Development Center, Inc.
Other substantive relationships: Inzucchi: Consultant for Merck & Co, Novartis, Takeda.Rosenstock: Consultant for Amylin Pharmaceuticals, Boehringer-Ingelheim, Bristol-Myers Squibb, Eli Lilly & Co. GlaxoSmithKline, Johnson & Johnson, MannKind Corporation, Merck & Co, Novartis Pharmaceuticals, Takeda Pharmaceuticals.Seufert: Consultant for Takeda Pharmaceuticals.

SYMPOSIUM

LIVING WITH DIABETES

Diabetes and disasters: natural and man-made

0549

Floods in Myanmar and earthquake in China

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Aim: To explore the understanding and management of diabetes in natural disasters.
Methodology: Two case studies from cyclone Nargis in Myanmar and Sichuan earthquake in 2008, historical survey of past emergency operations and available tools and approaches to health interventions in natural disasters exploring the understanding and management of diabetes and way forward.
Results: In current approaches to health in emergencies and natural disasters taken by the International Federation of Red Cross and Red Crescent Societies (IFRC) diabetes is roughly grouped as part of non-communicable diseases that are seen by many as less of a priority than direct injuries and communicable diseases (both acute and chronic). This is in part due to the overwhelming burden of those diseases in the early stages of emergencies but also to historic considerations that put non-communicable diseases as a task to be managed 'later and by the MoH'.
Diabetes, especially type I carries a specific difficulty in emergencies where managment is not included in the most commonly used tools such as the Interagency Emergency Health Kit (IEHK2006) among others.
In recent years, and with more analysis of the outcomes of natural disasters, it is now evident that while injuries cause the first wave of cases and communicable diseases the next, non-communicable cause a third wave of cases that comes much sooner than many believed earlier.
Conclusion: Diabetes role as a public health issue in natural disasters should be further explored together between humanitarian organisations and diabetes specialists to establish its burden and needs of people with the disease. Once established, collaboration to achieve proper management of diabetes should be mainstreamed and adapted as best practice. This should cover including diabetes in standard health assessments, diabetes management in standard tools, and involvement of diabetes organisations and specialists in relief and development efforts.

No conflict of interest

0550

Diabetes and disaster: how can we prepare for the storm and the role that camps played in assisting

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Diabetes camps have for many years provided supplies that remain at the end of their programs for the use of less fortunate programs throughout the world. With the cooperation of diabetes supply companies, these much-needed supplies are distributed via organizations such as Insulin For Life. There is never enough.
On August 29, 2005, Hurricane Katrina hit the southern USA coast, devastating parts of Louisiana, Mississippi and Florida. We all saw the devastation on our televisions at home. I received a call from Tom Karlya, of dLife Television, who asked what could we do to help. Within 48 hours we had the full cooperation of over 100 camps, as well as a number of courier companies and a collection/ distribution source (Pennington). This provided needed supplies for all folks with diabetes in the affected areas. In this workshop, we will be discussing other alternatives for effective global pre-planning.

The question remains, why were we not better prepared for this disaster and others worldwide. There have been several publications written on the topic of disaster preparedness for people with diabetes: There is a wonderful "Disaster Preparedness Guide: for people with diabetes", prepared by the ADA in 2006, that is available free of charge. The American Red Cross also has a booklet on disaster services.
In a book written by Drs. Richard and Diana Guthrie, the chapter on Disaster Preparedness suggests a few websites to consult: www.cdc.gov/docs/hurricanes.html from the Center for Disease Control (2007), www.diabeteshealth.com/read/2008/03/22/5484.html from Diabetes Health magazine
See you at the workshop. Please come with other ideas for sharing.
Thank you
Lorne Abramson, Executive Director, DECA

No conflict of interest

0551

Darfur / Ethiopia

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Darfur and Ethiopia are two very poor and underdeveloped regions in Africa with closely similar geographic, social and demographic features. Both regions have -originally- low average incomes and inadequate infrastructure for medical care in general and care of diabetes in particular. These circumstances had left the regions totally unprepared to deal with unexpected events. So, when disasters (of political instability and civil war, and lack of rain and famine) hit these regions diabetics faced a very difficult situation.
The problems of both regions are similar with differences only in the details. The situation can be summarized in the following points:

1. Epidemiologic data are scarce and the little available information is too limited to give any significant conclusions. Some areas are difficult even to reach.
2. Health care facilities are very deficient (In Darfur, there are three small, underequipped, and understaffed hospitals serving the 7 million population of the region).
3. There is severe shortage in medications required on a day to day basis for treatment of diabetics, particularly insulin. The available amounts of insulin are very limited and the problems of its transportation and storage in the very hot weather and limited availability of electric supply make its validity and usefulness very doubtful.
4. Management of diabetic complications especially the acute ones is very poor and sometimes impossible.
5. Local herbal therapy is the main available treatment for most diabetic patients in the region.
6. In spite of the efforts made by local governments, WHO, regional and international NGOs the situation is still desperate.

During my planned visit to both regions in late June, more details will be obtained and discussion of the different aspects of the situation will be made.

No conflict of interest

0552

Gaza and Iraq

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Working at a University of Toronto laboratory in 1921 Fred Banting was able to make Insulin. Before this, for thousands of years, a diabetes diagnosis meant wasting away to certain death. Insulin discovery continues to save millions of lives world-wide. Now we have better Insulin and new methods of treatment to control our diabetes. Unfortunately, even today there are many diabetics who don't have access to insulin. Wars are the main cause of **insulin disasters**. In this article I have tried to show the problems of diabetics in Iraq and Gaza during the recent wars.
On March 20, 2003 with the invasion of Iraq by a multinational force, distribution of insulin was stopped. On June 3, trucks carrying tons of insulin arrived at the Iraq border. The shipment was the first insulin to arrive in Iraq since March. Keeping insulin cool in heat of 40–45^{oC} in Iraq without refrigerator was a major problem for diabetics. Even after the war there are many problems in the insulin supply chain in Iraq.
The situation in the Gaza remains critical as the blockade on the territory leaves Palestinians without electricity and with short supplies of medicine. Gaza is one of the most densely populated places in the world. In 2007, United Nations Relief and Works Agency for Palestine Refugees in the Near East treated approximately 23000 diabetic patients in Gaza. 23% of diabetics were considered to be at high risk of complications and death. Existing diabetes care services are inadequate for the needs of patients. People with diabetes in Gaza do not receive the support of dieticians, foot specialists, psychologists or diabetes educators.
Nevertheless, we hope that this article reminds the motivated readers that in a war zone like Iraq and Gaza, there are people living with diabetes, and that these people need help and hope.

No conflict of interest

SYMPOSIUM

EDUCATION

Psychosocial and behavioral interventions

0553

Behavioural therapies: useful in diabetes education?

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Aims: Optimal evidence-based strategies for improving diabetes self-care are not well established and strategies vary widely in real world diabetes education. This presentation will provide an overview of what is known about promoting self-care behaviour change, with reference to a systematic "review of reviews" of dietary and physical activity intervention and further reviews of diabetes education interventions.
Methods: We searched electronic bibliographic databases for systematic reviews, published from 1998-2008, of interventions for adults at high risk for type 2 diabetes /cardiovascular disease. Two reviewers undertook selection, data extraction, and methodological quality assessment.
Results: 30 articles met the inclusion criteria. These incorporated 129 analyses relating intervention components with effectiveness. Interventions produced clinically meaningful weight loss (3-5Kg at 12 months; 2-3Kg at 36 months) and increased physical activity (30-60mins/wk of moderate activity at 12-18 months). Greater intervention effectiveness was causally associated with engaging social support, targeting both diet and physical activity, and using well-defined /established behavior change techniques. Increased effectiveness was also associated with increased contact frequency and using a specific cluster of "self-regulatory" behaviour change techniques (specific goal-setting, self-monitoring, providing feedback, goal review). Intervention effectiveness was unrelated to intervention setting, delivery mode, study population and delivery provider. Evidence suggested the need for greater consideration of behaviour maintenance strategies.
Additional reviews of diabetes education interventions will be used to discuss the potential applicability of these findings to supporting other diabetes self-care behaviours.
Conclusions: Supporting behaviour change is possible through well-resourced and well designed behavioural interventions. To maximise the efficiency of interventions to support changes in diet and/or physical activity, practitioners and commissioning organisations should include the specific components we have identified as being associated with increased effectiveness. These recommendations may apply to supporting medication adherence and reducing smoking and alcohol use, but further research is needed to establish optimal intervention methods.

No conflict of interest

0554

Motivation, coherence, barriers or possibilities

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In 2020 lifestyle behaviour is believed to be responsible for 70% of all chronic diseases. It is also believed that 80% of all cardiovascular diseases, strokes and diabetes as well as 40% of all cancers can be prevented by healthy eating, regular exercise and tobacco cessation. The paradox is that we are much more successful in inventing new preventive medicine than in helping people living healthily and taking prescribed preventive medicine as recommended.

This presentation will explain the concept, barriers and possibilities of motivational interviewing which was first described by Miller in 1983 and afterwards developed into a coherent theory by Miller and Rollnick in 1991. Motivational interviewing can be learned by most health care providers in order to achieve recognition of health problems, and to promote and maintain behavior change for people with health problems. It is particularly useful in helping people who are reluctant or ambivalent towards a healthier lifestyle. The strategies of motivational interviewing are persuasive more than coercive, supportive more than argumentative. The overall goal is to increase the inner motivation so that change arises from within rather than being imposed from without.
This presentation will also document that motivational interviewing outperforms traditional advice giving in randomized clinical studies and meta-analysis. Although motivational interviewing is no miracle, it seems to be a step forward in helping people living with diabetes.

No conflict of interest

0555

Applying psychosocial strategies in diabetic patient education

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Diabetes education has long been held to be the cornerstone of effective diabetes care. The National Standards for Diabetes Self-Management Education have quantified the processes and structure that result in quality diabetes education programs. As the evolution of diabetes education has progressed, it has become evident that the patient's psychosocial needs, values, beliefs, and expectations strongly impact success related to the person's willingness to learn, apply their knowledge, and then to integrate it into their lifestyle choices for sustained self-management of their health.
The major goal of diabetes education is to provide knowledge and skill training, as well as to help the person with diabetes identify barriers, facilitate problem-solving and develop coping skills to achieve effective self-care management and improve the quality of life.
The AADE7 Self-Care Behaviors® framework provides an accurate and more encompassing perspective of Diabetes Self-Management Education/Training (DSME/T) by measuring behavioral outcomes, rather than solely focusing on completion of required content areas, thereby truly reflecting the best practice of DSME/T.
Based on extensive review of the literature and expert consensus, 7 health-related self-care behaviors were identified as the unique and measureable outcomes of effective diabetes education, thereby shifting diabetes education from a content-driven practice to an outcomes-driven practice. This movement further facilitated a "patient centered/driven" approach to diabetes education and health management.
Population outcomes measurement is a very critical component of Diabetes Self-Management Education/Training. It is very important for the effectiveness of interventions to be documented, enabling an enhanced understanding of which interventions/strategies are most appropriate for a given population. Among other advantages, it informs the practice about effectiveness of specific interventions. It also informs the patient about their health status, allowing them to make informed and effective decisions/choices regarding approaches they select as a part of their diabetes self-care.

Conflict of interest:
Other substantive relationships: Eli Lilly and Company: DIN Educator Team Leader/Consultant

0556

Cultivating effective parent-adolescent teamwork for diabetes management

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Effective daily management of pediatric type 1 diabetes requires organization and attention to recurring treatment and monitoring tasks, such as blood glucose monitoring, insulin administration, dietary intake and physical activity, as well as problem solving to correct or prevent unwanted glycemic fluctuations. While adolescents must acquire skills that enable them to complete these tasks without direct parental involvement, the notion that parents of adolescents should completely withdraw from diabetes management has come under increasing scrutiny. Mounting research evidence over the past decade indicates that healthy parent-adolescent teamwork is a crucial element of effective family management of type 1 diabetes. Several studies have shown that youth with low levels of supportive involvement in diabetes management are prone to adverse outcomes including inadequate treatment adherence, poor glycemic control, excessive health care utilization and poor quality of life. Conversely, those who enjoy more parental support and involvement tend to realize more favorable diabetes outcomes. Other studies point to ongoing affective support, parental monitoring of diabetes management and effectiveness of parent-adolescent communication as important elements of parental supportive involvement.
This presentation will summarize the above line of research, deriving a conceptual model of the variables that may mediate and moderate an effective evolution of the parental role from one of direct involvement in diabetes management to that of consultative and affective support. Randomized controlled trials of pertinent psychological and behavioral intervention strategies will be reviewed, including several ongoing investigations. Gaps in the available empirical research and suggested directions for future research will be offered. The available empirical research suggests that family management of type 1 diabetes during adolescence presents very difficult challenges, but that the accumulation of more knowledge about the family context of successful management and the empirical validation of pertinent psychological interventions offer cause for optimism.

No conflict of interest

SYMPOSIUM

HEALTHCARE AND EPIDEMIOLOGY

Successful models of intervention from around the world

0557

Africa

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Although the exact magnitude of the problem in most of the countries in sub-Saharan Africa is not known, diabetes is becoming a serious threat to public health throughout the region. One of the major factors driving the diabetes epidemic in Africa is urbanization. This migration is usually associated with a change in lifestyle from a relatively healthy traditional pattern to an urban environment of increased food quantity and reduced quality, low levels of exercise, smoking and increased alcohol availability. This rapid epidemiological transition is driving the emergence of increasing prevalence rates of type 2 diabetes and hypertension with increase in mortality. At present infective diseases such as HIV/AIDS, tuberculosis and malaria contribute to predominant mortality in sub-Saharan Africa. It is however predicted that by 2020 non-communicable diseases (NCDs) will proportionately overtake infections as the major cause of mortality. The diabetes care delivery agenda in sub-Saharan Africa is dominated by poverty where 33 out of the 40 (82%) of the world's most heavily indebted poor countries are situated. In most of these countries, costs of managing diabetes and its complications have to compete with other national priorities such as anti-retroviral drugs, tuberculosis treatment and malarial control programs.
This presentation will expand on diabetes epidemiology, diseases burden and care delivery in sub-Saharan Africa emphasizing the different models of intervention in the Region. Justification for such models of intervention were (a) the prevalence of diabetes is gradually increasing causing high morbidity, mortality and disability, (b) the increasing potential impact on livelihoods of local communities and increasing expenditure and economic losses within households which are already in poor state, (c) diabetes and other non-communicable diseases (NCDs) threaten to overwhelm already-stretched health services, and (d) diabetes shares common modifiable risk factors with other NCDs thus making diabetes program an entry point for a national NCD program.

No conflict of interest

0558

Enhancing quality diabetes care in the Americas; role of the Pan American Health Organization (PAHO)

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Diabetes is a staggering health problem in the Americas where its prevalence is expected to double between 2007 and 2025. The Directing Council of the Regional Office of the Americas of the World Health Organization, the Pan American Health Organization (WHO/PAHO) composed of Ministers of Health from all countries of the American Continent approved in 2008 a strategy and resolution entitled **Population and individual approaches to the prevention and management of diabetes and obesity**. This strategy and resolution calls for actions by governments, civil society and WHO/PAHO to prevent diabetes and its complications among individuals and communities. In accordance with its commitment WHO/PAHO is currently providing advice to Member States on a variety of issues related to diabetes and its complications. This presentation outlines information about various diabetes projects led by WHO/PAHO in collaboration with Ministries of Health across the American Region. Data produced by these projects include new diabetes prevalence estimates, as well as new indicators of quality of diabetes care. WHO/PAHO is promoting the need to redesign health systems to better manage diabetes and other chronic diseases in primary care settings, across Latin America and the Caribbean. In order to illustrate how this can be done, quality of care demonstration projects have been established in more than 15 countries. The aim of these projects is to improve quality of diabetes care through a collaborative effort. Good examples of success are the VIDA and the Building Blocks projects in Mexico and Paraguay respectively. Various successful diabetes educational programs have been created including distance education courses for health professionals in Chile, Costa Rica, Cuba and Mexico, and for patients in Chile. As a direct consequence of these activities new health policies have been introduced in many countries in the region, supporting improved diabetes testing and use of medication as well as new programs to improve surveillance and management of diabetes. In conclusion there has been an increase in public and health professional awareness of diabetes during recent years in the Americas, and together with the recent political support from Health Ministers, has led to the creation of many new diabetes prevention and control demonstration projects, programs and policies. It is still to be seen if this renewed interest in diabetes prevention and control will translate in diminishing the burden of the diabetes epidemic in the Americas.

No conflict of interest

0559

Payment for performance

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Diabetes is one of the most common chronic conditions managed in primary care and previous studies have found large variations in care in people with diabetes. A new contract which included the Quality and Outcomes Framework (QOF) for general practitioners in the UK was introduced to improve the quality of primary care. This is the first time a pay for performance incentive scheme has been used to improve the quality of care delivered to all patients in the entire country. A number of studies have shown that overall, there have been improvements in process and intermediate outcomes of care for people with Type 2 diabetes. There is also some evidence that QOF may have reduced inequalities in diabetes care between affluent and deprived areas, but women and individuals from certain ethnic minority groups appear to have benefited least from this initiative. The magnitude of improvement in diabetes care appears to differ between ethnic groups, thus potentially widening existing disparities in care. There is also currently no evidence on the impact of introduction of QOF on morbidity and mortality. QOF is evolving and the indicators are continuously being revised in the light of achievements of targets. There are also a number of limitations to the indicators and less is known about the impact of QOF on aspects of diabetes care not reflected in the framework, including self management and continuity of care. Future indicators are to undergo numerous changes including shifting the emphasis from process to harder outcomes. From 2009, National Institute for Health and Clinical Excellence will be responsible for developing the indicators using a more transparent review process with input from patients, carers, primary care professionals and other stakeholders. Indicators will be assessed on the basis of the cost, as well as their clinical effectiveness.

Conflict of interest:
Other substantive relationships: Prof Khunti was Royal College of General Practitioners representative on the Quality and Outcome review panel.

0560

The role of IT registries

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The use of computers in medicine and management creates electronic data that, with effort, can be archived into databases. These databases can then be searched to identify persons with diabetes, using variables such as drugs purchased, hospital discharge diagnoses, outpatient diagnoses, and test results. However, despite the name, the resulting diabetes "registries" are much more than just lists. Many have evolved into large databases containing all available data about persons with diabetes. This allows them to be used to identify gaps in care, and patients at high risk, so that preventive action can be taken. In countries with centralized purchasing, registries can be used to make better decisions about the kinds and amounts of drugs and testing supplies to buy. Registries are also widely used to measure quality of care. In some countries quality results are posted publicly and/or used to determine the payments that doctors receive. A recent innovation is to feed the results of registry analyses back into the electronic medical record, forming a complete circle of data creation and use. Now, scientists and programmers are building diabetes treatment simulators from registry data. When combined with data from randomized clinical trials and with genetic test results and knowledge, these computer programs estimate the lifetime risks and benefits of each specific treatment for each specific person living with diabetes, empowering individuals to see all their options and choose the ones that will be most beneficial and that they can accomplish and afford. Simulation also helps doctors integrate the growing mass of data, research, and guideline recommendations, which has outgrown any brain's capacity to process and remember. Registry data allow simulation to be much safer and more effective, because assumptions about risks can be based on local data and local circumstances, anywhere in the world, including in developing countries.

Conflict of interest:
Employee: The author is an employee of Kaiser Permanente, a not-for-profit health system that has been a leader in developing and using diabetes registries for its own members.
Commercially-sponsored research: Since 1996, Dr. Brown's Center has had research contracts to support the development of a diabetes treatment simulation program, the Evidence-Based Medicine Integrator, from SmithKline Beecham (now GSK), Merck, Sanofi (now Sanofi Aventis), and Takeda Pharmaceuticals North America. Grants also were received from the US National Library of Medicine and the US Agency for Healthcare Quality and Research.
Other substantive relationships: Dr Brown leads the team that developed the Evidence-Based Medicine Integrator, a free, open-source diabetes simulator that is available on Google Code.

ORAL PRESENTATION

LIVING WITH DIABETES

Lifestyle issues in self-management

O-0561

A website about diabetes in children and adolescents: interactive contents and evolution

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Introduction: In November 2007, Fundación para la Diabetes launched a site on Diabetes in Children and Adolescents at www.fundaciondiabetes.org, where parents, children and teenagers, teachers, healthcare workers and

the public at large can find information on: training courses and the latest techniques and therapies; forums where to exchange experiences and extend knowledge on recent developments.
Most of the protocols involved in assessing the excellence of health-related websites include such standard indicators as: transparency; ease-of-access; user-friendly; up-to-date content; reliable information sources; degree of interactivity. The site's interactive side comprises forums and message boards, introduced to promote patient empowerment.
Objective: To describe and analyze the evolution of the "Diabetes in Children and Adolescents" site, since its launch, in November, 2007.
Specifically:
1. Describe contents and quantify how different sections on the website have evolved.
2. Analyze levels of activity and user message-content, as exchanged on the site's various forums.

Method:
1. News items, articles, reading material, legal issues, interviews, surveys, activities, letters, links and the Newsletter were all quantified, from inception date through to March 2009.
2. 164 user messages were analyzed. Each message was established as a unit of analysis and assigned several codes; they were also analyzed to establish presence/absence of various coding categories - subsumed under other broader categories: social support, illness and treatment issues, social processes and/or expressing emotions.

Results:
1. Between November 2007 and March 2009: over 350,000 pages were visited; 400 news items, 26 articles and 12 pdf-format books published; 50 legal questions dealt with; resident experts answered over 1,500 user-questions in our Interview section; 1,000 people were polled, in 25 surveys; as many as 30 new activities and projects were announced; 200 Quick Links were created; we received over 200 letters from over 22,000 Newsletter subscribers.
2. Forums: topics discussed were: family (70.1%), symptoms (63.4%), informational support (51.2%), optimism (55.5%), gratitude (48.2%), emotional support (34.1%), discrimination (6.7%), sadness (5.5%).

Conclusions: This website answers the need for information and experience-exchange among those users whom it was designed for, as proven by the rapid growth rate shown by each of the site's interactive sections.
In addition, the forum section provides users with a space where to express specific needs and feelings of a psychological nature and/or matters relating to their families.

No conflict of interest

O-0562

The peculiarities of quality of life of adolescents with type 1 diabetes

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Morbidity rate of diabetes mellitus all over the world point out to the necessity of comprehensive studying the psychological peculiarities of specific social group — adolescents with T1DM, and also their QOL and psychological components.
Objective: To find out the peculiarities of QOL and the psychological well-being of adolescents with T1DM in comparison with their healthy fellows.
Materials and methods: Total 62 **adolescents** with T1DM (28m, 34f), mean age (M±s) 15,1±2,8 yrs (13,00-18,00), age of T1DM manifestation 5,1±3,9 yrs were provided with the questionnaire General and Diabetes Modul PedsQL™4.0 including estimation of «Physical Functioning» (PF), «Emotional Functioning» (EF), «Social Functioning» (SF),), «School Functioning» (ScF); and Scales of Psychological Well-being Inventory (SPWB): «Positive relationships with others» (PR), «Autonomy» (AU), «Environment Mastery» (EM), «Self-acceptance» (SA), «Personal Growth» (PG) and «Purpose in Life (PL).
Results: The decrease of all indices was defined according to General Modul PedsQL™4.0: PF (58,4±16,2; p<0,05), EF (70,8±18,8; p<0,01), SF (75,1±17,4; p<0,01), ScF (42,3±22,1; p<0,05) and Diabetes Modul PedsQL™4.0: EF (49±11,3), DF (60,3±16,2), PF 1 (73,2±21,9) at adolescents in comparison with the healthy ones. The decrease of all the indices was revealed in adolescents with T1DM according to all scales: PR (61,1±10,9; p<0,001), AU (56,4±11,1; p<0,0001), EM (60,1±10,1; p<0,0001), SA (56,6±11,1, p<0,0001), PG (62,8±10,7; p<0,001), PL (62,2±11,1; p<0,001). On having analyzed the data of QOL according to the sex of adolescents and the data of General Modul PedsQL no differences have been received, Diabetes Modul — the indices of DF at boys noticeably lower than at girls (56,6±20,6; p<0,01), as for other scales the boys are leading — on scale EF (57,1±23,8; p<0,01) end SF (77,9±24,8; p<0,01). According to SPWB the data of SA appeared to be higher at boys (60,1±10,1; p<0,01). The analysis of the results allows us to suppose that girls perceive themselves more critical with underestimated self-appraisal and as the result, they better follow the special diet, physical exercises, glucose self-control and all these factors influence positively on their psychological functioning.
Conclusion: The received data point out to the importance of studying in detail QOL phenomenon and ways of optimization for the delivery of professional health and psychological care to the given group of adolescents. The work on anxiety correction is necessary as an excessive mental tension may influence on the physical recovering. This does not have less significance than biological methods of treatment but often turns out to become decisive factors defining the disease outcome.

No conflict of interest

O-0563

Impact of sexual dysfunction on the relationship between type 2 diabetic men and their female partners

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Background and objective: Male sexual dysfunction among type 2 diabetics would include disorders of libido, erectile dysfunction(ED), retrograde ejaculation and premature ejaculation.Sexual dysfunction has been associated with a range of negative psychosocial consequnces including anxiety, depression, distress in men and their female partners.Sexual dysfunction compromises multiple aspects of a patient's life and interpersonal relationships. The current study examines the effects of sexual dysfunction on the relationship between type 2 diabetic men and their female partners.
Methods: Consecutive type 2 diabetic men attending a diabetic clinic in Jos,Nigeria were interviewed with the aid of a questionnaire for the presence of ED, reduced libido, premature ejaculation and retrograde ejaculation. Information was also abtained on sociodemographic characteristics, duration of diabetes, relationship consequence of sexual dysfunction and fertility.
Results: Information on sexual function was obtained from 66 patients. The patients' age(Mean±SD) was 56±8.8 years, median diabetes duration was 7 years(range<1-20) and median duration of sexual dysfunction was 3 years.
Fifty three(80.3%) of the patients had one form of sexual dysfunction or the other with overall prevalence of ED, reduced libido, premature ejaculation and retrograde ejaculation being 51.5%, 53.0%, 19.7% and 18.25% respectively. Only three(4.5%) of the participants had relationship problem not attributed to sexual dysfunction.Seventeen(32.1%) of those with sexual dysfunction had relationship problems with their female partners resulting from sexual dysfunction.Nine(17%) suffered resentment and 1 abuse(1.9%) from their partners.Two(3.8%) complained of infidelity while Five(9.4%) said that their partners were not happy/satisfied. Four(7.5%) of the patients had fertility problem.
Conclusion: Relationship problems are quite common between type 2 diabetic men and their female partners.This could impact negatively on the psychic and overall quality of life of these individuals. Sexual dysfunction may also contribute to infertility among these patients.Management should also include addressing the relationship problems and its psychosocial consequences. A study to assess the psychosocial consequences of sexual dysfunction directly from the female partners of type 2 diabetic men may be more revealing

No conflict of interest

O-0564

Spirituality, transformation and diabetes management in young adults with diabetes

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Background: Spirituality is an important aspect of wellbeing; which enables people with diabetes to manage their diabetes and stressful situations.
Aims: To explore: 1) how young adults with diabetes defined spirituality, 2) the relationship between spirituality and coping in young adults with diabetes. 'Spirituality' referred to the inner self that empowers people to manage difficult situations, find meaning in life situations and connect with other people and the whole universe.
Methods: An exploratory study was conducted in three phases:
- Survey (n=100) young adults with diabetes aged 18-30 years. Data were collected using the coping questionnaire for young adult with diabetes (CQYAD) and the spirituality questionnaire (SQ) developed and validated for the study.
- Interviews (n=15) with young adults with diabetes.
- Focus groups (n=5) with young adults with diabetes.

Results and findings: Males had higher self-efficacy score and social-focused coping behaviours ($p<0.003$ and $p< 0.004$ respectively). Females were more spiritual ($p< 0.01$). There was no significant difference in spirituality between religious and non-religious participants. Shorter duration of diabetes was associated with higher spiritual needs ($p< 0.02$) and spiritual practices ($p< 0.01$). Coping was correlated with spirituality, Kendall's tua ($p< 0.01$). Self-awareness was significantly related to coping ($p=0.000$) and lower HbA1c ($p<0.01$). The higher the spirituality score, the lower HbA1c ($p<0.04$).
The interview data revealed that participants defined spirituality as 'sense of self', 'connectedness with people and nature', and 'finding meaning in life'. The themes central to the definitions and participants' coping ability were regarding as 'spirituality an essential aspect of life', 'the diabetes journey' and 'the need for holistic care'.
Significantly, these data were confirmed in the focus group; but the group discussion enriched the data and the definition. Participants felt spirituality encompassed 'body, mind, soul and connections to health,' that 'diabetes was a transformational journey,' and that 'health professionals treat diabetes rather than the whole person'.
Conclusions:
- Young adults with diabetes defined spirituality as an essential to holistic care and a transformational journey.
- Spirituality is an important coping strategy for young adults with diabetes and helps them cope with stressful situations and self-manage diabetes.

No conflict of interest

O-0565

Development and validation of an 'Activity-Friendliness Index' and its association with residential obesity and diabetes rates

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Aims: There is an association between neighborhood characteristics and the health and health behaviors of residents. This is particularly evident in the development of obesity and type 2 diabetes, conditions which are greatly influenced by a person's physical activity and diet. Herein we describe the development and validation of an urban residential 'Activity-Friendly Index' (AFI). We also examine how activity friendliness relates to obesity and diabetes.
Methods: Through a comprehensive review of the literature and factor analysis we identified a set of variables that formed the AFI. Identified components included the availability of banks, convenience stores, grocery stores and restaurants, access to public transit, dwelling density and size and street connectivity. We used network analysis within a Geographic Information System (GIS) to measure these characteristics using residential points in Toronto, Canada. The index was validated using a variety of measures of physical activity from the Canadian census and population health and transportation surveys. Logistic regression was used to examine the association of the AFI with the likelihood of being obese and having diabetes.
Results: As residential activity-friendliness (AFI) increased so also did rates of walking, cycling, general activity levels and transit use. In contrast, residential activity-friendliness was associated with lower rates of driving and car-ownership. In the most activity-friendly areas (highest AFI quintile) the average daily number of walking or biking trips per person was nearly triple, and the percent of people who walk or cycle to work was 5 to 6 times higher than that found in the least activity-friendly areas. Moreover, the percentage of people with obesity was 23% lower in the highest AFI areas as compared to the lowest. When neighbourhood AFI was evaluated as a risk factor for diabetes, we found that people living in the three lowest AFI quintiles had diabetes rates that were 8-17% higher ($p= 0.05$) than those living in the two highest AFI quintiles. These results persisted after controlling for age, sex, income, visible minority status, and education.
Discussion/conclusions: The Activity-Friendliness Index is significantly associated with residential rates of physical activity. Furthermore, it is significantly associated with residential obesity and diabetes rates. This research identifies potentially modifiable urban design characteristics that, if considered in municipal planning and health policies, may improve health status in urban populations.

No conflict of interest

O-0566

Sleep duration, lifestyle intervention and incidence of type 2 diabetes in impaired glucose tolerance: the Finnish Diabetes Prevention Study

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Background: Sleep disturbances have become increasingly prevalent in modern society, affecting millions of people. Both short and long sleep duration have frequently been found to be associated with an increased risk for diabetes. However, the underlying mechanisms are still largely unknown.
Objective: The aim of the present study was to examine the association between sleep duration and type 2 diabetes after lifestyle intervention in overweight people with impaired glucose tolerance in a 7-year prospective follow-up.
Methods: 522 individuals (aged 40-64 years) were randomly allocated either to an intensive diet-exercise counseling group or a control group. Diabetes incidence during follow-up was calculated according to sleep duration at baseline. Sleep duration was obtained for a 24 h period. Physical activity, dietary intakes, bodyweight and immune mediators (CRP, IL-6) were measured.
Results: Interaction between sleep duration and treatment group was statistically significant ($p=0.002$). In the control group, the adjusted hazard ratios with 95% CI for diabetes were 2.25 (1.34-3.76) and 2.92 (1.79-4.78) in the sleep duration groups 9-9.5 h and =10h, respectively, compared with that of 7-8.5 hours. In contrast, sleep duration did not influence the incidence of diabetes in the intervention group; for sleep duration groups 9-9.5 h and =10 h, the adjusted hazard ratios with 95% CI were 1.08 (0.59-1.97) and 0.71 (0.33-1.54), respectively, compared with that in the reference group (7-8.5 h sleep). Lifestyle intervention resulted in similar improvement in body weight, insulin sensitivity and immune mediator levels regardless of the sleep duration.
Conclusion: Long sleep duration is associated with increased type 2 diabetes risk. Lifestyle intervention aiming at weight reduction, healthy diet and increased physical activity ameliorates this excess risk.

No conflict of interest

ORAL PRESENTATION

EDUCATION

Innovations and application of IT to diabetes education

O-0567

Translating a significant personal experience in stage performance: a new approach for patients and health care providers

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Aims: When confronted with a disease, whether acute or chronic, each individual has to bear its psychosocial burden (illness). We tend to hide our inner suffering. Illness therefore becomes "encapsulated", acting as an internal foreign body which may influence our perception of life, our choices and our attitude towards the disease.
With the aim of helping patients to better cope with their ***disease***, we developed a 3-day-workshop in which 5-6 participants write about a significant personal experience. They are subsequently asked to ***stage-direct their own writing*** with the help of two professional actors and a professional stage director.
If writing allows the participants to verbalize their feelings and emotions, the stage direction enables them to physically express, on stage, their internal suffering.
Methods and results: Today 150 people have participated in the workshops: patients (with diabetes and long-term complications) and health-care providers who are confronted with chronic situations and traumatic events.
A qualitative preliminary study has shown that, after the workshop, the majority of participants develop a more positive attitude towards their ***disease***.
Non-directive interviews, participative observation and ***analysis of video-recordings*** allowed us to identify several elements facilitating the change.

Attitudinal changes	Reasons of change
Improved coping capacity with the suffering associated with a negative event	Taking distance from the painful event
Decreased sense of loneliness and isolation	Sharing one's suffering with other participants
Increased awareness of one's personal power to make creative choices (empowerment)	Becoming stage-director of one's own life experience
Transformation of the negative perception of a life experience with an increased sense of meaning and value	Transforming a painful experience in a symbolic artistic theatrical representation

The improvement observed in the patients motivated health-care providers to take part in this process.
Discussion: The translation of a personal painful experience in a theatrical form, with acted words, music, lights and colors, becomes the occasion to view it, not from the rather fixed standpoint of the symptom and the suffering, but from the ever-creative one of the resources and competences that such experience awakens in each individual. The participant becomes the stage-director of his own history, discovering a new sense of empowerment in the way he can influence his own life. The theatrical process is the tool by which a different value and meaning can be attributed to the painful event. All the participants experienced a sense of liberation and lightness following the workshop.
This kind of elaboration of one's personal experience is the result of a creative process in which the participant is accompanied by experts of the creative expression.

No conflict of interest

O-0568

A "didactic interactive clock" to visualise the interconnections between various aspects of diabetes care and their integration into patients' daily life schedule

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Background: Many diabetic patients have difficulties to connect the various aspects of their treatment and integrate them in their daily life schedule. Improved strategies to enhance patients' understanding of the interconnections between treatments and their schedule, action of insulin, physical activity and risks for hypoglycaemias are important.

Method: We created a didactic tool which allows having an overview of the various aspects of diabetes care according to daytime, in a dialog with the patient, to help him to become autonomous in the management of its treatment. As a visual support we used a 24 hour circular clock of plasticized cardboard (1 meter diameter) held on a metallic board. Magnetic cards symbolizing various aspects of treatments were placed on the clock at the relevant time: check glycaemia, take oral antidiabetic drugs, inject insulin, take meals and snacks, make physical activity and recognize risk moments for hypoglycaemia. A card reminding of insulin preparations' action profiles was placed in the centre of the clock. The clock was used during collective courses, but couldn't be printed. Between 1993 and 2008, 1000 patients and 700 nurses benefitted from this didactic contribution. The nurses were asked to evaluate their satisfaction with this tool by filling a questionnaire. Tested items included the perception of interaction of treatments, the visibility of action of insulin, and the utility to use such a tool with the patient to estimate what he retained of the teaching and to make a visual synthesis. Outcomes were measured on an analog scale ranging from 0 to 10.
Results:
Understanding how to use the clock: within 5 minutes.
Interaction of the treatments: 9.9
Visibility of the curves of insulin: 9.9.
Capacity of the tool to allow to make connections with the past or future events 9.7.
Utility to give to the patients these syntheses: 9.9.
Contribution of the clock to evaluate and sum up the diabetic knowledge of the patient: 9.9.
Discussion: Most nurses found the clock easy to use and found it a useful contribution
A computerized interactive version will be available as of April 2009. It could be used with all types of computers. Staff can print the results and give them to the patient.
The use of this tool offers wide perspectives for diabetes type 1 and 2 patients followed as well in a hospital environment as private office. The realization of this synthesis with the patient, allows the nurses to estimate the understanding he has of his treatment, and the patient to visualize a typical treatment day. It is even possible for patients to use the program alone at home to anticipate changes and integrate them into their life.
After using the tool, an evaluation with a questionnaire will be given to the patients with diabetes. Same items as for the nurses will be estimated.

No conflict of interest

O-0569

The Physical Activity and Exercise Tool-Kit: Effectiveness of a new resource for diabetes educators

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Physical activity and exercise (PAE) are essential in the prevention and management of diabetes. Diabetes educators (DEs) are often looked to as the primary source of information for those living with diabetes and are well positioned to provide counselling on PAE. However, DEs often receive little training in exercise prescription and do not feel adequately prepared to effectively counsel patients regarding PAE. While DEs' personal perceptions (e.g., self-efficacy) have been shown to be key determinants of their behaviour, their beliefs in their clients' abilities (e.g., other efficacy, perceived attitudes) have received little attention. The present study examined the effectiveness of the 'Physical Activity and Exercise Tool-kit" in increasing both DEs' perceptions surrounding PAE counselling and of their clients' abilities in, and attitudes towards PAE. Using a 2 (group) by 2 (time) quasi-experimental design, DEs (N = 121) were assigned to either an intervention or standard care condition. The intervention group was provided with training on PAE counselling including the "Physical Activity and Exercise Tool-kit," a theory driven, evidence based resource specifically designed for DEs. The standard care group was referred to Canada's Physical Activity Guide. Measures of counselling efficacy, referral efficacy, attitudes, and perceived difficulty, as well as other efficacy, and perceived client attitudes were administered at baseline and 6 months. To examine the effectiveness of the 'Tool-kit' three separate repeated measures MANOVAs were conducted. Examination of DEs' efficacy beliefs revealed a significant group by time interaction ($p = .03$). Follow-up tests indicated

that the interaction was significant for counselling efficacy (p = .02) such that participants in the intervention group were more confident about PAE counselling at 6 months (M6mo = 68.3) as compared to baseline (Mbase = 54.0) and as compared to the standard care group at both time points (Mbase = 48.9, M6mo = 50.4). In addition, there were multiple significant main effects for time across the separate analyses. Follow-up tests revealed significant increases over time in DEs' counselling efficacy (p = .01), perceived difficulty (p < .001) and confidence in their clients' ability to manage PAE (p = .001). These findings suggest that the 'Tool-kit' represents an effective training resource for DEs in the area of PAE counselling. While there is the need for examination of the effectiveness of the 'Tool-kit' over the longer term, and on the translation of increased counselling efficacy to improved PAE counselling, the present study suggests that incorporation of the 'Tool-kit' may have best practice implications for the way in which PAE is promoted in diabetes care.

No conflict of interest

O-0570

Benefits accrued by augmenting traditional diabetes education with self-management education: a randomized controlled trial

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Aims: This goal of this randomized controlled trial was to compare the effectiveness of Diabetes Patient Education to Diabetes Patient Education augmented by participation in the Stanford Chronic Disease Self-Management Program (CDSMP).

Methods: Newly diagnosed adults with type 2 diabetes living in Richmond BC were referred to the Diabetes Education Centre at Richmond Hospital by their family doctor. If they were interested in participating in the project they completed outcome measures and were randomly assigned to a group that would receive regular Diabetes Education (Control Group) or to a Group that would receive regular Diabetes Education and then participate in a community CDSMP (Experimental Group). In total 321 people registered and 169 were placed in the Experimental Group and 152 in the Control Group. Of the 169 subjects placed in the Experimental Group, only 82 completed the community CDSMP. Subjects in both groups completed the outcome measures again at six months. Outcome measures included A1C, weight, self-rated health, Health Distress, Role Limitations, Fatigue, Shortness of Breath, Pain, Self-efficacy, Communication with Doctor, and the Diabetes Empowerment Scale.

Tests were conducted which compared the baseline outcome measure scores of the 87 subjects originally placed in the Experimental Group but who had not participated in the CDSMP to the baseline outcome measure scores of the 152 subjects originally placed in the CG, and no differences were found. A pre- and six-month post- program-matched pair design comparison was used with: a) the 82 subjects originally placed in the Experimental Group who had completed the intervention; b) the 152 subjects originally placed in the Control Group; and c) 239 subjects that comprised the 152 subjects originally placed in the Control Group and the 87 subjects originally placed in the Experimental Group but who had not participated in the community CDSMP.

Results: A pre- and six-month post-program matched comparison design analysis found statistically significant improvements in all three groups in A1C and weight. As well, the Experimental Group had statistically significant improvements in 11 additional outcomes.

The RCT analysis investigated whether the changes in the Experimental Group were significantly different to changes in the Control Group. The Experimental Group had statistically significant greater positive changes than the Control Group in seven outcome measures: Perceived Health Status; Health Distress; Fatigue; Total nights in hospital; Self-efficacy to manage symptoms; Communication with Physician; and the three subscales of the Diabetes Empowerment Scale.

Discussion/Conclusion: Augmenting traditional Diabetes Patient Education with Self-Management Education brings about important additional improvements.

No conflict of interest

O-0571

An innovative approach to provision of diabetes education in the inpatient setting

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Objective: This project evaluates the impact of an educational program rollout with content that is evidence-based and a dissemination plan that utilizes adult education principles, continuous quality improvement strategies and change management theory.

Background: Our program had identified that the consultation process for diabetes specialty services in the inpatient setting was becoming increasingly onerous and yet outcomes were difficult to measure. Average numbers of consults for the 07-08 period were 11 per week. The project was designed to build on the opportunities that the environment provided and work in small successes that would then lead to bigger successes. The percentage of inpatients with diabetes in the surgical departments average 19% and medical departments 48%. Average lengths of stay for the same departments during that period were 8.5 and 10.3 respectively. Since the number of diabetes inpatients is on the rise, it is crucial that front-line inpatient staff have the skills to troubleshoot and better manage diabetes care.

Methods: A review of the literature with regards to change theory, and outcome measures of education provided in health care established the basis for the data collection. Staff completed knowledge tests pre education which were repeated again at 1 month and 6 months post education. Chart audits to reflect the translation of knowledge into practice impacts were conducted. Staff and patient interviews provided insight into the impressions and satisfaction of the roll-out. Quantitative measures such as the number of handouts taken from the "Diabetes Resource Box" added a measure that reflected the use of the tools provided.

Results: The "Plan Do Study Act" cycle was used to move the initiatives forward within the organization. Data collection and interpretation of findings with regards to the evaluation of this implementation is ongoing as of the submission of this abstract. Results will be available in September 2009.

Discussion/conclusion: The initial findings suggested that given the opportunity to brainstorm regarding present practices within the hospital, patient care areas had some interest, ideas and internal capacity to enhance their knowledge, tools and ability to support patients with diabetes. Through individualizing a dissemination strategy and empowering participants to proactively engage in diabetes management the intent was to not only enhance the practice of today, but also build a foundation for sustainable change in the future practice.

Practice implications: The outcomes will be used to inform practice in terms of future plans for internal diabetes education and management. The ongoing sustainability plan will include regular evaluation of the process and setting up accountability at the local level.

No conflict of interest

O-0572

Community based diabetes self-management (DSM) program for individuals with significant mental illness - a pilot program

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Background: Individuals who are socially marginalized and have significant mental illness (SMI) are at higher risk for developing diabetes. Barriers to using traditional interventions and diabetes education include: physical health and social determinants of health such as language, low health literacy, stigma of mental health and socioeconomic status.

Research suggests DSM Education that includes an empowerment framework, adult education principles, and addresses social determinants of health, may be more effective in clinical and self-management outcomes.

Objectives: 1) Provide access to group education for individuals with SMI. 2) Promote increased knowledge and self-efficacy relating to diabetes management while living with a mental health diagnosis. 3) Promote peer support while using adult education principles.

Methods:

- Setting: Urban primary care clinic linked with a teaching hospital.
- Participants: A total of 11 adults with type 2 diabetes with SMI.
- Program: Designed by a multidisciplinary team using the principles of health promotion and adult education. The program emphasized experiential learning with a focus on goal setting and problem solving strategies. Participants attended 6 or 7 weekly sessions which included the following aspects of DSM: blood glucose monitoring, medication, nutrition, physical activity and stress management. Features of the program included healthy snacks, financial assistance for transportation costs, a pedometer and a program-specific Participant Handbook.
- Evaluation: Participants completed pre- and post- measures of a) satisfaction in knowledge of diabetes and b) satisfaction of self-care related to diabetes. Participants completed a short survey to evaluate each session.

Outcome: The program was successful in increasing access to culturally specific education and supports for socially marginalized individuals with diabetes and SMI. There was a 90-100% attendance rate across both program phases. Participants demonstrated an increase in personal satisfaction of both diabetes knowledge and diabetes self-care. Specifically, participants reported increased knowledge with respect to disease progression, weight management and medication effects. Participants reported behaviour change relating to grocery shopping, eating behaviour and physical activity. Participant literacy levels required adjusting delivery and evaluation strategies.

Conclusions: The program provides evidence for the effectiveness of education that includes the following factors: 1) tailored to the culture of the population, 2) based in empowerment & self-management, 3) address socio-economic barriers to access and participation, 4) promote active learning and peer support.

No conflict of interest

O-0573

Ambulatory glucose profile (AGP): development of a common, web-based application to record and report continuous glucose monitoring data

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Aims: Develop, clinically test and implement a common web-based system for recording and reporting data from **continuous glucose monitoring (CGM)** devices independent of manufacturer.

Methods: Our secure web-based reporting system has the ability to convert data from commercially available CGM devices into a common program, Ambulatory Glucose Profile (AGP) and display all data without regard to date using five time series smoothed curves (10th, 25th, 50th (median), 75th and 90th frequency percentiles) that **visually** and **statistically** portray overall glucose exposure (area under the curve), variability (inter-quartile range within each hour, averaged across a modal day) and stability (consistent change across all hours of the modal day). AGP graphics are interactive and are accompanied by statistical analysis. CGM devices are uploaded at the user's computer. The AGP program is accessed through a password protected system. AGP parses the raw CGM data, validates it against a set of data quality rules, and loads it into a structured database. The user can then generate an AGP for an individual subject or for a group of subjects. Dietary, activity and medication information can also be entered.

Results: Ninety-two subjects were followed for periods of from two-weeks to one year employing DexCom (DexCom), Navigator (Abbott) or Guardian (Medtronic). For all subjects, CGM data were uploaded to a PC and glucose exposure, variability and stability were reported using a common graphic (not shown) and statistical (see table) format. Using AGP analysis we compared the relative glucose exposure, variability and stability for subjects with various degrees of glucose intolerance and different treatment modalities. We found differences in glucose exposure, variability and stability that were inconsistent with levels of $HbA_{1c.}$ For example, subjects with type 2 diabetes treated with non-insulin therapies produced 46% greater glucose exposure than those with type 1 diabetes treated with pump therapy although both groups had similar average HbA_{1c}.

Conclusions: Glucose data from three commercially available CGM devices were uploaded into the AGP analysis program which allowed direct comparison of glucose exposure, variability and stability of people with type 1 or type 2 diabetes.

	HbA_{1c} (%)	Glucose Exposure (mg-24hr/dL)	Glucose Variability (mg/dL)	Glucose Stability (mg/dL/hr)
Type 1 Pump (8)	7.1 ±1.2	2436±245	72±23	8.4±2.2
Type 1 Multiple Injections (19)	7.9±0.9	3419±1152	78±25	11.5±3.3
Type 2 Insulin (19)	7.8±1.0	2738±774	74±28	12.9±8.5
Type 2 Non-Insulin (46)	6.8±1.0	3558±876	52±17	8.5±3.1

No conflict of interest

O-0574

IT-based life style intervention tool "Metaboli-Net" is developed and applied to high risk patients for type 2 diabetes

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Aims: Life style intervention is a basic and economical strategy to prevent diabetes. However, it is quite hard for the high risk patients to get the timely education by health-care specialist. We developed the novel IT-based support system, "Metaboli-Net". In this study, we examined the effect of Metaboli-net on the life-style of prediabetic patients(IGT/IFG).

Methods: We applied this intervention tool for prediabetic patients including IFG or IGT(n=30, M/F=13/17). They were divided into 3 groups and managed by each educator(dietitian). The educating program consisted of three components, 1) self monitoring of diet/exercise/body weight, 2)advice and empowerment approach by educator, and 3)virtual-group work using social network service (SNS). Each participant sends the snapshots of consecutive three days diet using cell phone camera and the exercise record of walking to their homepage. Then, the dietitian estimates the diet balance and the exercise level, and advises the tentative habitual goal for each person. Every one week, the dietitian repeats the same step, finds the custom barrier. Moreover, a participant is allowed to see the record of other participants. This SNS analogue enables them to compete with each other.

Results: After 2 months program, the withdrawal rate was (20%,6/30) The main reason for withdrawal was the trouble to send the snapshot. But, the participants were basically satisfied with the information and specialist's advice supplied via "Metaboli-Net". The participants commented the following: "Metaboli-net is very useful for self-monitoring", "the advice of dietitian is very concrete and easy to follow". In fact, participant achieved some habitual change such as the regular diet intake or exercise reinforcement(67%,16/24) and even the reduction of body weight(29%,7/24). Interestingly, SNS is likely to be effective to maintain the life style intervention, since the sharing of other participants' information activates the self motivation and promoted the communication within the group.

Discussion: In this study, we developed Metaboli-net and applied it to prediabetic patients. Although the withdrawal rate(20%) was higher than we expected, we can improve the system to avoid the program bug. In general, the intervention using web site seems less effective than the direct education in real world. This mainly comes from the one-sided flow of communication. In Metaboli-net, the participants can communicate with their own dietitian and even access the other participants' information. They feel protected and very free to communicate. The better communication is the key to establish the web-linked educating system. In conclusion, IT-based tool "Metaboli-Net" is effective and applicable to intervene the diet unbalance and exercise frequency in prediabetic patients. We expect this tool is also applicable to type2 diabetic patients.

No conflict of interest

SYMPOSIUM

ASSOCIATION DEVELOPMENT

Education initiatives

0575

Diabetes education in Africa - gains, challenges and the way forward

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Aims: To highlight the gains in Diabetes education, identify challenges in Diabetes education and propose possible solutions for effective Diabetes Education.
Methods: Descriptive cross sectional survey by means of questionnaires to countries in sub Saharan Africa. Final results to be expressed in descriptive statistics.
Results: Preliminary results show that in most of the countries surveyed Diabetes care is underway though mainly didactic. Behavioral modification approaches are yet to be instituted. Training of staff is underway and many countries are paying more attention to Diabetes education. Care centres are also being set up or exist in a number of countries. However Policies for non communicable diseases are nonexistent and this often hampers progress in Diabetes care. Particular concerns are lack of guidelines for education and no certification for educators. Career pathways for educators are lacking and trained personnel are often channeled to other departments. All is however not lost, deliberate steps need to be taken to enhance trained staff retention such as providing incentives, certification and career pathways. Care teams for effective care are also not in place in many centres. Political will is also wanting.
Conclusion: Diabetes Education in most African countries is still a novel approach. In most countries, Diabetes Education has been in place for less than a decade. It is imperative that changes are put in place to ensure the adoption of behavior change approaches in Education, and provision of cost effective culturally sensitive material to maximize on limited resources. Staff retention issues also need to be addressed. Research should be an ongoing process to inform the process especially evaluation of centres being set up and the education process and outcome.

No conflict of interest

0576

Evaluation of the Diabetes Association of Jamaica's Lay Diabetes Education Program

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Objective: To evaluate the effectiveness of lay diabetes facilitators to increase knowledge and improve control among persons with diabetes.
Methodology: A randomized control study on persons with diabetes was done in 16 primary health care centres in Jamaica to compare the effect of ***lay diabetes facilitators*** on Glycaemia, Body Mass Index (BMI) and knowledge. 160 persons with diabetes were recruited for intervention and 160 as a control. HbA1c and BMI were measured at baseline and six months.
Results: Mean A1c at baseline for the intervention and control groups were 7.9% and 8% respectively. After 6 months the intervention group showed a mean decrease of 0.6% while the control group showed an increase of 0.6% ($P<0.001$). There was no statistically significant change in their body mass index between groups. Among the intervention group, 96% had an increased knowledge of diabetes compared to 19.3% in the control group ($P <0.001$).
Conclusion: Patients educated by lay diabetes facilitators were more knowledgeable about diabetes and had improved metabolic control.

No conflict of interest

0577

Updating primary health care personnel to improve health care delivery in diabetes

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The bulk of diabetes care is provided at the level of primary health care (PHC) and > 80% of adults with diabetes receive their care from primary care physicians.
PHC personnel work as a team (PHCT). They vary in cadres, disciplines and levels of qualification.
Education: in diabetes is a must for the PHCT. It is evidence based and is regularly updated from within the diabetes education community. Education should apply to new and existing workforce and to all cadres in the team as part of continuing professional development.
Diabetes self-care management is critical for persons with diabetes (p.w.d). National standards for diabetes self-management education (DSME) exist for use of care providers for p.w.d. They increase adherence to standards of care.
There is no one "best" education programme/approach.
Clinical care: Training of PHCT in clinical care when supported by written guidelines, clinical algorithms, target setting, clearly defined goals and protocols have been shown to improve and maintain standards of care. Early referral as indicated to higher tiers of care saves life and helps improve care delivery.
Non-pharmacological therapy: comprise lifestyle changes. Medical nutrition therapy combined with physical /exercise therapy offer successful intervention for prevention and curative care. Currently standards and guidelines exist for both modalities of treatment.
Expertise in behavioural change is required to support patients making lifestyle changes.
Pharmacotherapy: Early introduction of insulin therapy for improved management of Type 2 diabetes (T2 DM) is now widely accepted and practiced. Guidelines for the use of the newly introduced agents arise from clinical trials which have shown clearly improved clinical care outcomes.
No one drug has emerged a one-size-fits-all medication.
Most of the newer agents have drawbacks on expense and ready availability which may limit their use for now in certain settings.
Conclusion: The opinion is expressed that primay care practice personnel are a logical focus for implementing strategies that improve diabetes care delivery.

No conflict of interest

0578

Co-operation and strategic partnerships – a way to multiple influencing in society

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Background: Diabetes education, in a broad sense, should be targeted to the whole society. If 10 % of population (which is the case in Finland) has diabetes, basic knowledge of the disease should be included in the all-round education. In addition 13 % of the population are in risk of diabetes. These numbers demand public awareness of diabetes and its risk factors. Crucial important is that political decision-makers are aware of diabetes and its complications.
Co-operation and strategic partnerships are needed. In a joint statement in May 2009 the International Diabetes Federation, International Union Against Cancer and World Heart Federation fully support the WHO Action Plan for the Global Strategy for the Prevention and Control of non-communicable diseases 2008-2013. Health systems cannot be built vertically, disease by disease. Comprehensive and integrated action at country level is the means to achieve success.
Methods: In Finland Diabetes Association and Finnish Heart Association have systematically developed strategic partnership already 10 years. Both associations are implementing national public health programmes, i.e. National Diabetes Programme DEHKO 2000-2010 and Action Plan for Promoting Finnish Heart Health 2005-2011. These programmes have provided a framework for common action and development. Together we have developed training for health care personnel and volunteers. We also have implemented common campaigns before parliamentary and municipal elections.
Results: Public awareness of diabetes and cardiovascular diseases has significantly increased. The new government established a Policy programme for health promotion. Group activities at the local level have increased.
Conclusion: Other parties in the field social and health care should not be seen as competitors. Common action means that we are stronger in influencing

in society. Co-operation and partnerships are appreciated by financiers because it builds up resources. Of course different organisational cultures face each other and it may cause troubles, but also produce a fruitful learning process.

No conflict of interest

DEBATE

LIVING WITH DIABETES

To vitamin D or not to vitamin D: a question on the aetiology of type 1 diabetes

0579

Against

R. Swaminathan[1]

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Although vitamin D status has been associated with development of type 1 diabetes mellitus, there are several reasons to suggest that it is premature to advocate vitamin D in the prevention of type 1 diabetes mellitus.

1. Epidemiological studies have shown strong association between sunlight exposure and the incidence of type 1 diabetes. From this, is it is assumed that the factor responsible is vitamin D. However vitamin D may be a surrogate marker of other effects of sunlight/UV exposure. There is evidence that both UVA and UVB radiation have direct immunosuppressant effect as well as indirect effect via neuropeptides such as α-melanocyte stimulating hormone, calcitonin gene related peptide and melatonin. The link between vitamin D and type 1 diabetes is similar to the effect of vitamin A and cancer as well as vitamin E and cardiovascular disease. In both instances randomised control trials failed to show any beneficial effect of supplementation of A and E on cancer or cardiovascular disease respectively. The inference from these observations is that there are other unmeasured confounding factors.
2. Second reason for doubting the link between vitamin D and type 1 diabetes is in the assessment of vitamin D status. Assays for the circulating form of vitamin D have problems. The most popular assay, an immunoassay, does not adequately detect 25-hydroxy vitamin D2. Even the more definitive method using tandem mass spectrometry has standardisation problems as evidenced by the recent episode in one of the largest laboratories in the US. Furthermore there is no consensus as to what is an adequate level of serum 25-hydroxy vitamin D which is optimal for health. Recommendations vary from 50nmol/L to >100nmol/L of 25 hydroxy vitamin D.
3. Observational studies show a moderate effect of vitamin D intake and the risk of developing type 1 diabetes. There are no randomised controlled trials with long term follow-up to substantiate the claim that vitamin D can prevent the risk of developing type 1 diabetes.

No conflict of interest

0580

For

L. Gnudi[1]

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Vitamin D is either synthesized endogenously, through skin exposure to sunlight, or exogenously from ingestion of foods and supplements. Of note, in northern geographical regions (northern United States, Canada, northern Europe etc.), little or no vitamin D is produced in the skin during winter months. The observed higher prevalence of type 1 diabetes in the northern hemisphere and a recognised similar "opposite" scenario for the southern hemisphere has triggered speculations about a possible role of vitamin D in the pathogenesis of type 1 diabetes.

It is important to remember the low concordance for type 1 diabetes among identical twins which suggest that, besides genetic predisposing factors, environment plays an important role.

Type 1 diabetes is characterised by autoimmune destruction of insulin-producing beta cells in the pancreas; vitamin D is known to retain an immune-modulatory function (tolerance) that could prevent/ modulate beta cell autoimmunity.

Studies have highlighted the importance for active vitamin D in inhibiting the induction of other autoimmune diseases such as autoimmune thyroiditis, inflammatory bowel disease, rheumatoid arthritis, and others.

Evidence of lower plasma vitamin D levels at diagnosis of type 1 diabetes compared to controls has been described, and studies on vitamin D supplementation to children or pregnant mothers have been associated with lower incidence of type 1 diabetes, although results have not always been consistent.

Vitamin D appears to be not only involved in calcium metabolism, but it seems to have other important physiological functions mainly as an immune-modulator and inhibitor of inflammation.

Future applications of vitamin D in the pathogenesis of type 1 diabetes are conceivable, especially because its effects on calcium metabolism can be dissociated from its immunomodulatory effects by the use of structural analogues of the molecule.

Randomised prospective clinical trials are needed to investigate this new potential approach.

No conflict of interest

OPEN FORUM

Diabetes x 4 - it's just a way of life

0581

Diabetes x 4 - it's just a way of life

S. Renouf[1], *E. Renouf*[1]

Before May 2002 Steve and Elissa had five healthy children aged between 9 ½ and 1. By March 2004 three of their young boys were diagnosed with type 1 diabetes, Charlie was 3, Billy was 8 ½ and Fred 2 ¾. Steve had previously been diagnosed with Type 1 diabetes in 1992 aged 22. All three boys and Steve face a life of finger prick tests, balancing insulin injections, food and exercise just to keep them alive and healthy. Billy and Fred were also diagnosed with Coeliac Disease shortly after they developed diabetes. This means they can't eat foods containing wheat, oats, barley, rye and malt.

Steve and Elissa Renouf's story is one of inspiration, determination and courage. It's a story of a family united to share their knowledge and practical experience, by instilling confidence in their own children as well other diabetics, while helping to simplify the lives of people living with Diabetes.

Steve and Elissa hope by telling of the disbelief, grief, frustrations and emotional ordeals they experienced, along with the risks, compromises and challenges they faced and still face today, their story will assist in relieving the anxiety for all who are surrounded by similar situations, like theirs.

There is no better story than one of someone successful in fulfilling an aspiration, especially one that benefits the lives of other people. This story will leave you inspired, motivated and uplifted. In today's world, we all live with daily challenges and risks and we find we can never get enough of those enriching, genuine life stories that prove how, together with the help and experience of others, we can carry on each day and live life to the entirety, no matter what defies us.

No conflict of interest

INCOMING PRESIDENT'S ORATION

From yesterday to tomorrow: making a difference to global diabetes

0582

From yesterday to tommorrow: making a difference to global diabetes

J.C. Mbanya[1]

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The misperceptions of diabetes are diminishing in the face of mounting evidence. The evidence shows that diabetes does not distinguish between rich and poor; that it is not a disease of the elderly; and that in many cases it can be prevented. But these misperceptions are not diminishing quickly enough for millions of people with diabetes. According to new figures from the International Diabetes Federation (IDF), some 285 million people will have diabetes in 2010 and this is expected to increase by more than 50% to almost

440 million in 2030. Developing countries will continue to bear the brunt of the burden of diabetes, and those most affected remain in the productive age group of between 40 and 59. Governments must intervene now with preventive and cost-effective measures if people with diabetes and those at risk are to have a better tomorrow. The treatment and technology exist today for people with diabetes to manage their disease successfully and to enable them to lead full and productive lives. Yet, the reality is that for millions of people with diabetes, modern treatment and technology is but a dream, and the right to live a full life has been denied through ignorance, lack of resources and education, and inadequate health facilities. We have to act today to make a difference for people with diabetes tomorrow. For many that day cannot come soon enough. IDF has an obligation as the global advocate for people with diabetes to ensure that no child should die of diabetes from lack of insulin, that no person should suffer needlessly from complications such as the diabetic foot resulting in amputation because of the lack of proper care and medication, and that no family should carry the heavy financial burden of the disease from lack of resources. These challenges have to be met full on at every level. It is time to think creatively and to break down old paradigms. Studies show increasingly strong linkages between diabetes and many other diseases, such as heart disease, tuberculosis and HIV/AIDS. The way forward is to address the common challenges together of optimal healthcare, low-cost treatment, access to care, and improved training and education that are faced by countries in dealing with diabetes and these diseases. IDF will strengthen its alliances with international organizations representing heart disease and cancer, forge new ones and lead the way in global advocacy. It will support the WHO Noncommunicable Diseases Action Plan, 2008-2013, which recognizes diabetes as a development issue. At the same time, health resources should not be perceived as being in competition between communicable and noncommunicable diseases within a health system. The objective should be to work across the board to develop a health system that can offer optimal care to all those who need it. Our aim is to achieve sustainable health systems as called for in United Nations Resolution 61/225, and to build a global fund for health committed to helping health systems develop sustainable, cost-effective measures for prevention and care. IDF policy and strategy will centre on the person with diabetes. The success of our global advocacy must be measured by an improved quality of life for the person with diabetes. In the next three years, IDF is committed to strengthening its regional organizations to enable them to drive programmes that will develop and equip member associations to be powerful advocates and equal partners in building sustainable and effective health systems in their countries. IDF will enlist new and non-traditional partners to further national, regional and global advocacy to improve the quality of life of people with diabetes everywhere.

No conflict of interest

MEET-THE-EXPERT

CLINICAL RESEARCH

Blood pressure management in diabetes

0583

Blood pressure management in diabetes

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Blood pressure lowering and blockade of the renin-angiotensin system are key strategies in the prevention and treatment of the renal and cardiovascular complications of diabetes. Despite our knowledge of its importance, it is often difficult to get blood pressure to target levels in a substantial proportion of patients. Moreover, the results of recent studies have created some controversies in the choice of anti-hypertensive agents that should be used and in the order in which they should be prescribed. Finally, the importance of masked hypertension and the role of ambulatory blood pressure monitoring in managing diabetic subjects may also need to be considered.

Conflict of interest:
Paid lecturing: Bristol-Myers Squibb, Sanofi-Aventis, Servier Laboratories, Novartis
Advisory board: Astra-Zeneca, Bristol-Myers Squibb, Sanofi-Aventis, Novartis
Commercially-sponsored research: Novartis

MEET-THE-EXPERT

Management of prediabetes and type 2 diabetes in adolescence

0584

Management of prediabetes and type 2 diabetes in adolescence

S. Caprio[1]
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The prevalence of type 2 diabetes (T2D) has increased significantly in children and adolescents in the last decade. What initially seemed to be a localized North American problem is appearing in other European, Asian, and South American countries. Moreover, multiple publications have recently reported an increasing prevalence of impaired fasting glucose and impaired glucose tolerance (IGT) - two pre-diabetic conditions - in children and adolescents. Thus, a disease that was until recently considered an adult phenomenon appears to be emerging in younger individuals and developing at an accelerated tempo.
Our group has been studying the metabolic defects leading to the development of impaired glucose tolerance in obese youth. Using epidemiological and physiological approaches, we reported a high prevalence of impaired glucose tolerance (IGT) in a multiethnic clinic based cohort of obese children and adolescents This work set the stage for a series of studies aimed at understanding the metabolic phenotype of pre-diabetes in youth, greatly emphasizing the emerging problem of T2DM in childhood obesity. Insulin resistance emerged as the best predictor of the 2hr glucose level and we demonstrated that alterations in the partitioning of fat in both muscle and abdominal tissues are closely linked to insulin sensitivity in obese adolescents with IGT. In a longitudinal study of 102 obese children and adolescents we investigated the dynamics of changes in insulin sensitivity and secretion and their interactions with weight changes over a period of 2 years. After only two years, we found a significant transition from IGT to T2DM in 30% of obese adolescents. This rapid rate of progression occurred with significant weight gain. Compared to youngsters whose glucose tolerance did not worsen, subjects who progressed from IGT to T2DM had severe insulin resistance and lower early insulin responses to glucose at baseline.
The results of the work described above have pointed out the pressing need for an intervention study in this high risk group in order to prevent progression of the disease.
We here will present some recent studies that have used insulin sensitizers to restore normal glucose tolerance in obese adolescents with IGT. This presentation will also discuss current treatment of type 2 diabetes in youth.

No conflict of interest

MEET-THE-EXPERT

Glucose variability: does it make a difference ?

0585

Glucose variability: does it make a difference ?

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One of the most controversial aspects of diabetes this decade has been the relative importance of glucose variability in the pathogenesis of diabetes-related complications. A figure from a report from the DCCT research group in 1995 was interpreted as suggesting a reduction of glucose variability in type 1 diabetes (due to more physiologic insulin regimens) resulted in an approximate 60% reduction in diabetes retinopathy progression. Later studies by Ceriello and Monier suggested glucose variability contributed to increases in oxidative stress which has been implicated in the fueling of diabetes vascular complications. Other large retrospective studies in a variety of different populations (including critically ill patients) also noted the importance of glucose variability in patient outcomes. However, this question is far from settled. Other studies have not noted difference in glucose variability result in improvements in outcomes. Retrospective analysis of the quarterly 7-point glucose measurements from the DCCT did not suggest differences in retinopathy or nephropathy progression, although interestingly variability of

A1C levels did. Last year the DCCT research group re-analyzed their 1995 data and concluded that there were no differences between the two groups in that study in ability of A1C to predict retinopathy or nephropathy. What is clear, and what is often over-looked, is that variability of glycemia predicts severe hypoglycemia. The final answer about the relative importance of glucose variability on both microvascular and macrovascular complications is far from settled, and can only be answered by a randomized controlled study. It is quite possible that neither A1C nor glucose variability can be examined alone but they need to be factored in together when assessing risks for complications.

Conflict of interest:
Advisory board: Johnson & Johnson, Roche
Commercially-sponsored research: Mannkind

MEET-THE-EXPERT

EDUCATION

How can we help our patients reduce hypoglycaemia unawareness?

0586

How can we help our patients reduce hypoglycaemia unawareness?

S.A. Amiel[1]
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Hypoglycaemia unawareness (HU), the occurrence of low blood glucose concentrations in the absence of any warning symptoms, affects up to a quarter of people with Type 1, and an increasing number of late Type 2, diabetes. New strategies are required to help people avoid or treat HU, which increases risk of severe hypoglycaemia five-fold. HU is associated with defective glucose counterregulatory responses to a falling blood glucose concentration – the normal neuro-endocrine stress responses to any given glucose concentration are reduced in magnitude and require a greater fall in glucose concentration to start at all. As a result, the triggering glucose concentration for symptom generation falls below that associated with onset of cognitive dysfunction. Confusion and abnormal behaviour become the first evidence of hypoglycaemia and the patient is rendered unable to experience symptoms and self-treat. Defective counterregulation and HU are induced by prior exposure to hypoglycaemia and may be an example of stress de-sensitization, a common phenomenon in physiology. Neuroimaging data in HU patients show reduced activation of brain centres involved in generating the stress response but also of brain areas involved in perception of the internal milieu. There is failure to de-activate brain centres involved in reward seeking and pleasure perception. Failure to perceive for oneself that a stress is unpleasant or dangerous reduces the motivation to change behaviour to avoid that stress in future. This may explain why purely educational strategies around improved diabetes control with avoidance of hypoglycaemia (known to restore awareness sustainably in approximately 50% of people with HU) fail to achieve lasting benefit in many other patients and why compliance with therapeutic change in patients with HU is reduced. New strategies based on techniques designed to help people overcome repetitive health-harming behaviours may be beneficial.

No conflict of interest

MEET-THE-EXPERT

FOUNDATION SCIENCE

Central regulation of food intake and metabolism

0587

Central regulation of food intake and metabolism

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The central nervous system serves as a central regulator of energy homeostasis by integrating signals from the periphery of the organism such as hormones as well as nutrient components to adapt food intake, energy expenditure and locomotor activity to the degree of peripheral energy sources. The presentation will focus on the genetic analysis of the interacting neurocircuits involved in these processes and how their activity is regulated by hormones such as leptin and insulin, as well as how hormonal control is further modified through nutrient components such as glucose and amino acids. Moreover, the neurocircuitry underlying the control of peripheral glucose metabolism and its regulation will be discussed. Taken together, deciphering the coordinated central nervous regulation of energy and peripheral glucose metabolism may provide new therapeutic approaches for both the obesity as well as the diabetes epidemic.

No conflict of interest

MEET-THE-EXPERT

EDUCATION

Managing older people with diabetes more effectively - avoiding pitfalls and rejecting some common beliefs

0588

Managing older people with diabetes more effectively - avoiding pitfalls and rejecting some common beliefs

A.J. Sinclair[1]
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Background: In many older subjects diabetes is often a dynamic and complex interaction between the relentless process of ageing, a major metabolic disturbance, widespread vascular disease, and functional loss. Cognitive dysfunction, depressive illness and falls are also important complications which require novel and innovative strategies to minimise their risk of development.
Older people with complex needs require multidisciplinary care, which is well coordinated across primary, secondary and residential care and social services. Given the relatively high use of hospital services by older people, hospitals can offer an effective intervention point for earlier diagnosis and better management of diabetes in older people. Information, education and support should be provided for older people to help them manage their diabetes.
Those in institutional care also pose new and difficult problems in management where the balance between effective glucose and blood pressure control and issues relating to quality of life and limited longevity are more striking and challenging.
Use of clinical guidelines: The inclusion of specific guidance on older people in the 2009 IDF Global Type 2 Guideline is a major step forward in enhancing diabetes care for this often neglected and vulnerable group. This presentation will spotlight key guidance and suggest how this can be implemented in routine clinical practice. The presentation will also outline a new global initiative in geriatric diabetes which aims to improve the quality of diabetes care and to stimulate new research.

No conflict of interest

DEBATE

ASSOCIATION DEVELOPMENT

Is prevention feasible ?

0589

Prevention of diabetes is not feasible in many countries: strategies to change

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Diabetes is a leading cause of blindness, kidney failure, heart attack, stroke and amputation. The number of people living with diabetes has increased considerably over the past 30 years. In 1985, an estimated 30 million people worldwide had diabetes. A little over a decade later, the figure had risen to over 150 million. Today, according to IDF figures, it exceeds 250 million. A further 300 million are at high risk of developing diabetes. Unless action is taken to implement effective prevention and control programmes, IDF predicts that the total number of people with diabetes will reach 380 million by 2025.
How can we deal with this pandemic?
Only by Prevention and Education. Prevention is divided itself into two components: prevention of Diabetes, and prevention or delay of Diabetes complications when the disease is already declared.
What are the factors that make the prevention of diabetes effective?:

1. strengthen knowledge about the disease.
2. strict follow of rules.
3. educational, emotional and psychological support.
4. massive advertising campaigns.
5. early detection of disease.
6. identify risk factors: obesity, high blood pressure, increased serum lipids, sedentary life ....
7. identify the family risk factors.
8. others

All these lead us to an essential need for the implementation of such programs: more resources, and the primary role of the state and the health authorities.
But what happens in most countries, especially in the underdeveloped:

1. lack of resources.
2. State policies are short-term policies, since the essential interest is to win the next election, while prevention is a long-term program, and its fruits are safe but may be delayed.

Here arises the need in these countries to create entities that could take control without having to be tied to the state´s aid, but can get help whenever it is offered.
Hence, we will present a model that we have in Dominican Republic for logging purposes.

No conflict of interest

0590

Prevention of diabetes is feasible with good planning in most countries

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Considering the global increasing prevalence of type 2 diabetes (T2D), as well as the simplicity of identifying individuals at high risk for such disease, implementation of intervention measures for its prevention is of great interest. Several studies have confirmed the benefits of lifestyle changes in preventing or postponing the progression from impaired glucose tolerance to T2D. On average a 50% reduction in incidence is seen in most studies, a result that is better than those reported in studies in which pharmacological interventions were used with the same purpose.
Despite this knowledge, however, the implementation of effective prevention programmes seems to meet various barriers in the general population and among politicians. Despite being a leading cause of death and serious disability worldwide, the public often perceive T2D as a relatively mild condition. Furthermore, many people do not know that T2D is preventable and that steps can be taken to minimise the risk of developing the disease. Further, prevention studies conducted in a routine clinical setting, evaluating the impact on morbidity, mortality and cost-effectiveness as primary outcomes, are needed. Undoubtedly, improved public awareness of T2DM and its link with obesity and physical inactivity is critical, not only to prevention but also management of diabetes. By building understanding of diabetes, changing beliefs and attitudes and promoting positive behaviours, such initiatives can help combat the global diabetes epidemic and improve the health and wellbeing of people.
Three main strategies may be proposed to deal with the problem: 1) to estimate the need and advocate for action; 2) to develop national policies, strategies and plans for prevention and care and 3) promote and implement community participation in prevention and care. T2D is preventable; solutions seem effective and the effort may be cost-effective.

No conflict of interest

POSTER DISCUSSIONS

MONDAY 19 OCTOBER

Complications - macrovascular 1

D-0591

Coronary artery lesions in asymptomatic diabetic patients are intimately associated with carotid artery plaque and renal function: analysis from multidetector computed tomography (MDCT)

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Indication of MDCT in early diagnosis of coronary artery disease (CAD) in diabetic patient has not been clarified yet. We performed MDCT under written informed consent to 45 type 2 diabetic patients (30 males and 15 females, mean age 58.6±11.0, mean BMI 26.1±3.67**,** mean HbA1c 6.8±1.0, smoker 39.1%) who have no symptoms or history of CAD. Blood pressure and LDL-cholesterol had already been controlled well. Patients treated with insulin or serum creatinine >1.0mg/dl were excluded, and all patients were negative for exercise-tolerance ECG test. As a result, only 15 patients (33.3%) had shown normal coronary arteries, which had neither plaque nor calcification. Coronary plaques were found in 26 patients (57.7%), and calcification was found in 25 patients (55.6%). There were 21 patients (46.7%) who had both plaque and calcification, and 10 (22.2%) of them were suspected of significant (>50%) stenosis. Patients with both plaque and calcification were classified as advanced lesion group (n=21), and other patients were grouped into non-advanced group(n=24). Advanced group was significantly higher than non-advanced group in age, serum creatinine, and carotid artery plaque score evaluated by ultrasonography. HbA1c, waist circumference, visceral fat area, adiponectin, cholesterol, and blood pressure were not significantly different between the groups. In multivariable analysis, plaque score and serum creatinine proved to be independent factors to estimate the existence of advanced coronary lesions. Thus we calculated the product of plaque score and serum creatinine as diabetes atherosclerotic index (DAI). DAI in the non-advanced and advanced group were 0.98±1.27 and 3.49±2.34, respectively (p<0.0001). In summary, high prevalence of coronary artery lesions were shown in asymptomatic patients with type2 diabetes, regardless of their glycemic control or adiposity. Serum creatinine level and carotid artery plaque score were suggested to be main clinical markers of CAD, and MDCT and/or cardioangiography should be considered at least when the patients show >4.0 in DAI (diabetes atherosclerotic index).

No conflict of interest

D-0592

Myocardial infarction and abnormal glucose tolerance: is fasting plasma glucose reliable to detect the glycaemic stress ?

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Introduction: Abnormal glucose tolerance (AGT) is more prevalent in patients with Coronary artery disease and doubles the risk of developing cardiovascular complications. There has not been a consensus on the timing and the type of test to assess glucose tolerance to stratify risk in this high risk cohort. The aim of our study was

- To assess glucose tolerance prior to discharge after AMI and
- To assess reliability of fasting plasma glucose(FPG) in assessing glycemic status after the index event and at routine follow-up, using 2hour post glucose (2hPG) as gold standard.

Methods: An initial retrospective analysis was done on patients admitted with AMI and without diabetes during 2006 and 2007. A 75gm glucose tolerance test (GTT) was offered to all patients prior to discharge, ideally on the fifth day after AMI. Family physicians were instructed to do a follow-up glycemic testing on patients with AGT, within a year of the index event. Patients with AGT were then prospectively called up to the diabetes clinic for a repeat GTT.

Results: 102 patients were admitted with AMI during the study period. Only 79 had GTT before discharge and hence were included in this study. 27/79 patients had AGT, with 20 having IGT(FPG-19 normal, 1 IFG) and 7 having 2hPG in diabetic range(FPG- 0 normal, 7 IFG). 2 patients with normal GTT had abnormal FPG (1 IFG, 1 DM). The sensitivity of FPG was only 30%, specificity being 96% with a positive predictive value of 80%. The detection rate of AGT by GTT was 34.1% compared to 12.6% by FPG.

	AGT +	AGT -	Total
FPG +	8	2	10
FPG -	19	50	69
Total	27	52	79

As follow up, FPG was done on 27 patients (2 lost to follow up) after a mean follow up period of 130 days (85-440 days). 19 patients had normal FPG, 1 DM and 7 IFG, giving a prevalence of 29.6%

A GTT was done on these 27 patients after a mean duration of 541 days (283-837 days). Two patients had already been diagnosed with diabetes, adding to 11/27 having AGT, with 7 IGT (FPG- 4 normal, 1 IFG, 2 DM) and 4 DM (FPG- 1 Normal, 3 DM). The sensitivity of FPG was 54%, specificity 100% and positive predictive value 100%. The detection rate of AGT by GTT was 40.8% with GTT compared to 22% by FPG.

	AGT +	AGT -	Total
FPG +	6	0	6
FPG -	5	16	21
Total	11	16	27

Conclusions: A significant number of patients (37%) have glycemic disturbance after AMI, which could represent undiagnosed DM or stress hyperglycemia. GTT has a higher diagnostic rate in this high risk population. FPG, as a single screening test for hyperglycemia, lacks adequate sensitivity to diagnose this metabolic disturbance. Larger studies are required to address the issue of ideal timeframe and the best screening test to detect glycemic status in this high risk cohort.

No conflict of interest

D-0593

Relationship between carotid intima-media thickness and silent cerebral infarction in Japanese subjects with type 2 diabetes

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Aims: Subjects with Type 2 diabetes are at increased risk for cerebrovascular diseases, especially silent cerebral infarction (SCI). Recently, the magnetic resonance (MR) imaging study has enabled us to detect SCI easily. However, it remains to be elucidated how to screen for SCI may be the most suitable for diabetic subjects. In the present study, we investigated the frequency of SCI with the MR imaging study as well as the relationship to the carotid arterial ultrasonography in Japanese subjects with Type 2 diabetes, in comparison with Japanese subjects without diabetes mellitus.

Methods: The MR imaging study of the brain and the carotid arterial ultrasound were performed in 217 consecutive Japanese subjects with Type 2 diabetes (116 men and 101 women, mean±SD age, 67.1±8.6 years). The non-diabetic subjects included 158 Japanese subjects (81 men and 77 women, mean±SD age, 66.3±7.4 years), who visited the health care check-up center of our institute without Type 2 diabetes. They were free of clinical symptoms of cerebrovascular disease. SCI was defined as an area of focal hyperintensity on T2-weighted images with corresponding low signal intensity on T1-weighted images, which was =3 mm in diameter. The relationship between SCI on MR and the intima-media thickness (IMT) of common carotid artery on ultrasonography was investigated using multiple logistic analysis. Various risk factors for SCI were examined using multiple logistic analyses in both groups.

Results: SCI was more frequently found in the diabetic group than in the non-diabetic group (60.4% and 47.5%, respectively, P <0.05). By univariate analysis, the age and PWV were significantly higher in the subjects with SCI than in those without it (68.5 *vs.* 64.4 years, P <0.01; 1731.9 *vs.* 1595.8 cm/s, P <0.01) in the non-diabetic group. In the diabetic group, the age, PWV, SBP and IMT were significantly higher in the subjects with SCI than in those without it (69.3 *vs.* 63.7 years, P <0.01; 1906.7 *vs.* 1718.0 cm/s, P <0.01; 140.6 *vs.* 129.4 mmHg, P <0.01; 1.27 *vs.*1.10 mm, P <0.01). Multiple logistic analyses indicated that the age (odds ratio [OR] = 1.09, 95% confidence interval [CI] = 1.04-1.15), SBP (OR = 1.06, 95% CI = 1.02-1.08) and IMT (OR = 4.16,

95% CI = 1.37-12.62) were independent risk factors of SCI in the diabetic group. In contrast, only the age was significantly associated with SCI in the non-diabetic group.
Conclusion: The carotid IMT, rather than PWV, can be a useful index for screening SCI in Japanese subjects with Type 2 diabetes.

No conflict of interest

D-0594

Effect of yohimbine hydrochloride in synergy between collagen and epinephrine in diabetic patients with acute coronary syndrome

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Aims: Patients with diabetes have increased *in vivo* platelet activity. Abnormal platelet function is a major cause of cardiovascular complications and ischemic events in diabetic patients.
Synergistic interactions among several platelet agonists namely collagen, epinephrine, ADP, ATP, serotonin can profoundly increase platelet aggregation. Platelet aggregation induced by synergy between collagen and epinephrine and its inhibition by yohimbine hydrochloride (YH), an a-2 adreno-receptor blocker, has been studied in patients with type2 diabetes and acute coronary syndrome.
Methods: To study the synergism between collagen and epinephrine, aggregometric study was performed with simultaneous application of collagen and epinephrine in 25 diabetic and 25 nondiabetic patients. The concentrations of epinephrine and collagen were so chosen that the individual agonists showed null response to it. Inhibitory effect of yohimbine hydrochloride (final concentration of 10µM) on this synergy was accessed by incubating the sample for 5 mins at 37 °C in the aggregometer.
Results: Synergism with collagen and epinephrine was stronger in diabetic patients. Mean platelet aggregation (synergistic) was 74.3±12.5% in diabetic and 62.8±15.7 % in nondiabetic patients (p=0.0062). The inhibition of synergism by YH (10µM) was less pronounced in diabetic patients in comparison to non-diabetics. But higher concentration of YH (15-20mM) was able to inhibit the synergy in diabetic patients.
Conclusion: Our study showed a key role of the a2A-adrenoreceptor in platelet aggregation in the setting of acute coronary syndrome in diabetic patients. Targeting this receptor and use of a2A-adrenoreceptor antagonists in combination with aspirin and clopidogrel could be particularly efficacious in this setting.

No conflict of interest

D-0595

Diagnosis of asymptomatic coronary atherosclerosis in patients with diabetes mellitus type 2 by multislice computed tomography

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A prospective longitudinal study was carried out in 118 patients with diabetes type 2, in which the findings of the determination of coronary calcium score were compared with the findings of the angiography by multislice computed tomography, with the objective of evaluating the usefulness of these techniques in the detection of sub clinic coronary atherosclerosis in patients with Diabetes Mellitus Type 2, and its relationship with some factors of cardiovascular risk.
An agreement of 44.1% was registered being both studies positive. The angiography study was more sensitive when identifying suggestive lesions of coronary atherosclerosis. The presence of soft plaques predominated in 55.9% of the total sample. The most affected blood vessels were left anterior descending (45.8%) and the right coronary artery (44.1) which made no difference with the calcium score technique. A lineal correlation between aging and the number of damaged vessels was demonstrated by both techniques (p = 0.003) and (p = 0.001) respectively.
We conclude that multislice computed tomography is useful for the detection of sub clinic coronary lesions in patients with diabetes which is more relevant as age (people age) advances.

No conflict of interest

Complications - nephropathy 1

D-0596

Progression of diabetic nephropathy vs. cross-talk between genetic variability in the RAAS system and its pharmacologic blockade: results of 7-years observational pharmacogenetic study

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Aims: There are multiple determinants of progression of diabetic nephropathy (DN) such as metabolic and blood pressure control, albumin-/proteinuria and genetics. One of the crucial pathogenic mechanisms is the over-activation of renin – angiotensin - aldosterone system (RAAS). We hypothesized that certain functional variants in the RAAS represent significant independent risk factors influencing the DN progression in subjects. Additionally, therapeutic benefit, predominantly based on the RAAS blockade by ACEIs and angiotensin receptor blockers (ARBs), might also be influenced by genetic variability within the RAAS components. Using clinical data collated during prospective follow-up of the cohort of diabetics with DN and advanced multivariate stat. methods we quantified the pathogenic contribution of main DN risk factors: (i) cumulative glycemia, blood pressure and proteinuria, (ii) other metabolic factors such as body weight and lipids in relation to the DN pharmacotherapy (i.e. cumulative received dose of ACEIs and ARBs) and carrier state of selected candidate (pharmaco)genetic variants.
Methods: Study was designed as a prospective follow-up (~7 yrs) study of subjects with T1DM or T2DM. Inclusion criteria at baseline (2001 - 2003) were as follows: diabetes duration at least 10; DN stage: persistent microalbuminuria to overt proteinuria; follow-up at least half of the period; any age; both genders. Study comprised a total of 215 subjects. Following end-points were considered: [1] renal (rate of GFR decline and/or doubling of S-creatinine over the follow-up time-period and/or reaching the end-stage renal disease stage requiring renal replacement therapy), [2] composite cardiovascular (myocardial infarction, stroke or sudden death) and [3] all-cause mortality. A total of 15 RAAS and RAAS-related variants were genotyped using appropriate methodology (PCR with RFLP, fluorescent-labelled probes (TaqMan) or direct sequencing).
Results and conclusions: Multiple time series analysis (by means of dynamic longitudinal analysis) for repetitive data (e.g. blood pressure or glycemia measurements) for which cumulative exposure (area under the curve) and trend of the particular variable represent potentially relevant information, and event occurrence at specified time-points (Kaplan-Meier curves or Cox regression models] were used to analyse data. All groups of factors – i.e. metabolic/hemodynamic, genetic and pharmacologic were found to significantly contribute to the DN progression rate (all $P < 0.05$). The relative contribution of metabolic/hemodynamic factors was superior to genetic and pharmacologic factors. Mode of interaction between the variables analysed was non-linear.
Supported by the grants from the Ministry of Health of Czech Republic (NR 9443-3/2007).

No conflict of interest

D-0597

RAS blockade prevents hypertension, albuminuria, tubular apoptosis and endoplasmic reticulum stress-associated gene expresssion in diabetic akita angiotensinogen-transgenic mice

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Introduction: Apoptosis of renal proximal tubular cells (RPTCs) frequently occurs in the diabetic kidney. The existence of a local intrarenal renin-angiotensin system (RAS) has been well-accepted and angiotensinogen (Agt) is the sole precursor of angiotensins. We have previously reported that transgenic (Tg) mice over-expressing rat Agt in their RPTCs are prone to develop hypertension, albuminuria and renal injury. Furthermore, hyperglycemia and intrarenal RAS act in concert to induce RPTC apoptosis in streptozotocin-induced diabetic Agt-Tg mice (J Am Soc Nephrol, 2008). However, the underlying molecular mechanisms remain incompletely understood.

Aims: The present study investigated whether RAS blockade could prevent hypertension, albuminuria, tubulointerstitial fibrosis, endoplasmic reticulum (ER)-stress and renal proximal tubular cell (RPTC) apoptosis in type 1 diabetic Akita Agt-Tg mice.

Methods: Diabetic Akita Agt-Tg mice were created by cross-breeding Akita mice with Agt-Tg specifically overexpressing Agt in their RPTCs. Non-Akita littermates served as controls. Animals were treated with or without RAS blockade (a combination of losartan (an antagonist of angiotensin II (Ang II)-receptor (AT1-R), 20 mg/kg/day) and perindopril (4 mg/kg/day)). Blood glucose, systolic blood pressure (SBP) and albuminuria were monitored weekly from 9 to 16 weeks of age. Left kidneys were processed for histology and apoptosis studies. Renal proximal tubules were isolated from right kidneys to quantify expression of pro-fibrosis and pro-apoptotic genes by real time-quantitative polymerase chain reaction assay and Western blotting.

Results: Akita Agt-Tg mice developed hyperglycemia and significantly higher SBPs, albumin/creatinine ratios, and kidney/body weight ratios as compared to Akita mice. Unlike kidneys from non-Akita mice, kidneys of Akita Agt-Tg mice exhibited hydronephrosis, severe tubulointerstitial fibrosis and enhanced apoptotic RPTCs. These were associated with increased expression of the transforming growth factor-beta1, collagen IV, fibronectin, plasminogen activator inhibitor-1 and ER-stress induced genes (caspase-12, GRP78 and CHOP), as well as caspase-9 and caspase-3. Treatment with RAS inhibitors prevented hypertension, albuminuria, pro-apoptotic and ER-induced gene expression in diabetic Akita Agt-Tg mice.

Conclusion: Our results indicate that hyperglycemia and intrarenal RAS activation act additively to stimulate SBP, tubulointerstitial fibrosis, RPTC apoptosis, pro-fibrotic and pro-apoptotic gene expression as well as ER-stress gene expression in diabetic kidneys. Furthermore, our data demonstrate the importance of suppressing intrarenal RAS activation in preventing hypertension, ER-stress and ultimately progression of diabetic nephropathy.

No conflict of interest

D-0598

Reactive oxygen species up-regulate BcL-2-modifying factor expression and induces apoptosis in renal proximal tubular cells of diabetic mice

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Background: We recently reported that hypertension, albuminuria and renal proximal tubular cell (RPTC) apoptosis are attenuated in type 2 diabetic db/db transgenic (Tg) mice specifically over-expressing catalase (Cat, an antioxidant enzyme) in the RPTCs, indicating that reactive oxygen species (ROS) are involved in the progression of nephropathy in db/db mice (Diabetes, 2008). By gene chip microarray analysis, we recently observed that Bcl-2 modifying factor (Bmf), a pro-apoptotic gene, is up-regulated in RPTCs from db/db mice, when compared to RPTCs from db/m+ (control) and db/db Cat-Tg mice. Bmf is a member of the BH3-only pro-apoptotic protein family and promotes apoptosis by heterodimerizing with pro-survival members of the Bcl-2 family. This finding was further validated by real-time quantitative polymerase chain reaction (RT-qPCR) and immunohistochemistry.

Aims: The present study aims to investigate whether Bmf expression is regulated by hyperglycemia via ROS generation in vivo and in vitro. In parallel, we aim to examine the role for Bmf in RPTC apoptosis.

Methods: Adult mice were left untreated or rendered diabetic with streptozotocin (STZ) with or without insulin treatment. Animals were euthanized at 4 weeks after STZ administration. Kidneys were processed immediately for immunohistochemical and apoptotic activity analysis. To study Bmf biological activity, overexpression assays in RPTCs were performed using cDNAs cloned from human and rat immortalized RPTCs by conventional reverse transcription-PCR. Human and rat immortalized RPTCs were cultured in normal glucose (5 mM D-glucose) or high glucose (25 mM D-glucose) medium in the absence or presence of rotenone (an inhibitor of the mitochondrial electron transport chain complex I) or Cat. Bmf expression in RPTCs was quantified by RT-qPCR.

Results: Immunohistochemical analysis show an increase in Bmf and heme oxygenase-1 (a marker of oxidative stress) expression in RPTCs of untreated diabetic mice, when compared to non-diabetic mice. Insulin treatment normalizes Bmf expression in RPTCs of STZ-induced diabetic mice. Additionally, human and rat RPTCs cultured in high-glucose milieu enhances Bmf mRNA expression, which is attenuated in the presence of rotenone or Cat. Finally, in vitro Bmf over-expression enhances RPTC apoptosis.

Conclusion: Our results demonstrate that hyperglycemia stimulates Bmf expression via reactive oxygen species generation, leading to RPTC apoptosis, and suggest a role for Bmf in inducing RPTC apoptosis and tubular atrophy in diabetic kidneys.

No conflict of interest

D-0599

Polymorphisms in the Protein Kinase C-ß gene (PRKCB1) predict development of kidney disease in a 8-year prospective Chinese cohort of type 2 diabetes

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Aims: Protein Kinase C-ß is an important cell-signaling intermediate and is believed to play an important role in the pathogenesis of diabetic nephropathy. The aim of our study was to examine the contribution of PKC-ß gene (*PRKCB1*) polymorphisms to diabetic kidney disease in a 8-year prospective Chinese cohort of patients with type 2 diabetes.

Methods: Eighteen tag SNPs (single nucleotide polymorphism) in the promoter region and spanning *PRKCB1* gene at r^2=0.8 based on HapMap CHB data were genotyped in 1172 Chinese patients without past history of chronic kidney disease at baseline. Associations of *PRKCB1* polymorphisms under additive, dominant and recessive genetic models with outcome of end stage renal disease or chronic kidney disease were assessed by Cox proportional hazard regression, adjusted for the conventional risk factors including sex, age, duration of T2D and drug treatments.

Results: During mean follow-up period of 7.9 ± 1.9 years, 90 of 1172 subjects (7.7%) progressed to end stage renal failure. We found that eight common SNPs significantly predict diabetic kidney disease ($P<0.05$). The T-allele and G-allele at polymorphisms rs3760106 and rs2575390, which are in high linkage disequilibrium (r^2 = 0.98 in the present study), showed the strongest association with the transition to end stage renal failure (HR (95% C.I.) = 2.25 (1.31 – 3.87), P = 0.0034; HR (95% C.I.) = 2.26 (1.31 – 3.88), P = 0.0033). There were also significantly increased risk for both CKD and ESRF with increasing numbers of risk alleles (P=0.0011 for CKD and P=0.0007 for ESRF) in the joint effect analysis. The adjusted risk for ESRF was 6.04 (95% C.I. 2.00-18.31) for patients with four or more alleles compared to patients without risk alleles. Likewise, the adjusted risk for CKD was 2.67 (95% C.I. 1.37-5.22) for patients with four or more risk alleles compared to patients without risk alleles.

Conclusion: In summary, our study suggests that genetic variants in the *PRKCB1* gene are important independent predictors for the development of diabetic nephropathy in Chinese population.

No conflict of interest

D-0600

Dietary n-3 long chain polyunsaturated fatty acids intake and diabetic nephropathy – cohort analysis of the Diabetes Control and Complications Trial (DCCT)

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Aims: Despite evidence suggesting potential benefits of intake of fish and fish oil on macrovascular complications in diabetes, their effects on microvascular complications including nephropathy are not well-established. We investigated the association between dietary n-3 long-chain polyunsaturated fatty acids (n-3 LC-PUFAs) and albuminuria in persons with type 1 diabetes.
Methods: We studied 1,436 participants aged 13 to 39 with type 1 diabetes at the beginning of the Diabetes Control and Complications Trial (DCCT) who were followed for up to 9 years, with dietary n-3 LC-PUFAs at baseline. Dietary n-3 LC-PUFAs obtained from diet history was defined as the average intake of eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA), divided into tertile distribution. Incident microalbuminuria was defined as the first occurrence of urinary albumin excretion rate (UAER) of >40 mg/24 hr sustained for at least 1 year. We used Cox proportional hazards regression models to estimate the hazard ratios comparing thirds of dietary n-3 LC-PUFAs with incident microalbuminuria. We used mixed-effects regression models with random intercepts to estimate the association between thirds of dietary n-3 LC-PUFAs and repeated measurements of UAER over the 9-year study period.
Results: In an average follow-up of 6.5 years, excluding 74 people without albuminuria at baseline, 95 people developed microalbuminuria. There was no significant association between dietary n-3 LC-PUFAs and incident microalbuminuria [Hazard ratio 1.30; 95% confidence interval (CI) 0.77-2.18, comparing extreme thirds of dietary n-3 LC-PUFAs] after adjusting for age, sex, body mass index, HbA1c, systolic blood pressure, UAER, creatinine clearance and serum triglyceride at baseline, dietary and lifestyle factors, and treatment randomization (intensive vs. conventional treatment). In an unadjusted analysis of the mixed-effects regression model, we observed an estimated difference in mean UAER between extreme thirds of dietary n-3 LC-PUFAs of -21.1 mg/24 hr (95% CI -37.5, -4.8; p=0.01). Having adjusted for years of follow-up and potential confounders, the difference in mean UAER between extreme thirds of dietary n-3 LC-PUFAs was -14.8 (95% CI -31.1, 1.4) mg/24 hr (p=0.08). In multivariate analyses, we observed a significant interaction between treatment randomization and dietary n-3 LC-PUFAs on the difference in mean UAER (p=0.007). In stratified analyses, we observed substantial differences in mean UAER [-28.8 (95% CI -58.7, 1.1) mg/24 hr for conventional treatment and 5.3 (95% CI -7.8, 18.5) mg/24 hr for intensive treatment], between extreme thirds of dietary n-3 LC-PUFAs after adjusting for potential confounders.
Conclusion: This study suggests that dietary n-3 LC-PUFAs is not associated with the risk of incident microalbuminuria. The effects of dietary n-3 LC-PUFAs on UAER differed between treatment interventions.

No conflict of interest

D-0601

GLUT2 expression in kidney of diabetic rats treated with insulin or phlorizin is regulated by HNF-1 alpha and HNF-3 beta

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Aims: We hypothesize that, in kidney of diabetic rats, hepatocyte nuclear factors (HNF-1a and HNF-3ß) play a critical role in the overexpression of glucose transporter protein GLUT2. Considering the important role of HNF-1a and HNF-3ß transcription factors in the regulation of GLUT2 transcriptional activity, we hypothesized that alterations of GLUT2 mRNA in kidney of diabetic rats may involve changes in the activity of these transcription factors. The purpose of the present study was to investigate the possible association between GLUT2 expression, and the expression and activity of HNF-1a and HNF-3ß, in kidney of diabetic rats treated with insulin or phlorizin.
Methods: GLUT2 mRNA (Northern blotting), HNF-1a and HNF-3ß mRNA (RT-PCR) and activity of transcription factors by electrophoretic Mobility Shift Assay (EMSA), were analized in renal cortex of non-diabetic, diabetic rats untreated, acutely (4h- and 12-hour) insulin or phlorizin treated and diabetic rats short-term (1-, 4- and 6-day) insulin or phlorizin treated.
Results: Plasma glucose concentration and 24-hour urinary glucose were increased ($p<0.001$), and plasma insulin concentration decreased ($p<0.0001$) in diabetic rats. Two-fold increase in GLUT2 mRNA ($p<0.001$) was observed in diabetic, accompanied by significant increases in HNF-1a ($p<0.0001$) and HNF-3ß ($p<0.01$) expression and binding activity. Additional 2-fold increase in GLUT2 mRNA ($p<0.001$) and HNF-3ß expression/activity ($p<0.01$) were observed in 12-hour insulin-treated rats. Six-days of insulin or phlorizin treatment decreased GLUT2 mRNA ($p<0.001$ and $p<0.05$, respectively) and HNF-1a expression and activity ($p<0.001$, insulin and $p<0.05$, phlorizin) to levels of non-diabetic rats, whereas HNF-3ß decreased to levels of non-insulin-treated diabetic rats ($p<0.01$).
Conclusion: we demonstrated in kidney of diabetic rats that overexpression of GLUT2 is related to the increased expression and activity of HNF1-a and HNF-3ß transcription factors. Furthermore, insulin therapy-induced regulation of GLUT2 expression also involves these transcription factors. However, the insulin-induced participation of HNF1-a and HNF-3ß is time-course-specific: the rapid transient additional increase GLUT2 expression involves HNF-3ß, and the 6-day induced restoration of the gene expression involves both HNF1-a and HNF-3ß transcription factors. Considering the possible importance of the GLUT2 protein in the genesis and progression of diabetic nephropathy, we hope that the knowledge of the GLUT2 transcriptional regulation may contribute to control the local gene expression in the future.

No conflict of interest

D-0602

Incidence and predictors of renal function decline versus renal disease in a cohort of type 1 diabetes

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Aims: As the sensitivity of albuminuria in predicting loss of renal function has been questioned in diabetes, we determined the incidence and risk factors for declining kidney function and, separately, for renal disease in a cohort of individuals with childhood onset type 1 diabetes, participating in the Pittsburgh Epidemiology of Diabetes Complications study.
Methods: At study entry, mean participant age was 28 and diabetes duration 19 years. Mild renal function decline was defined as estimated (by both the Cockcroft-Gault (CG) and MDRD formulae) glomerular filtration rate (eGFR) <60 ml/min/1.73 m^2. Analyses were also conducted to assess predictors of severe loss of renal function (eGFR <30 ml/min/1.73 m^2). Microalbuminuria (MA) was defined as albumin excretion rate (AER)>20 µg/min and overt nephropathy (ON) as AER>200 µg/min in at least 2/3 validated timed urine collections.
Results: During 18 years of follow-up, 16.1% (84/521) and 38.3% (170/444) exhibited mild eGFR decline by CG and MDRD, respectively, whereas 7.1% (CG) and 11% (MDRD) exhibited severe declines of renal function. Moreover, 40.5% (125/309) and 17.3% (75/434) of study participants developed MA and ON, respectively. In multivariable Cox models with backward elimination and adjusting for baseline eGFR, predictors of mild eGFR decline by CG included diabetes duration (HR=1.04, 95% CI=1.002-1.07), female gender (HR=2.21, 95% CI=1.38-3.52), HbA_{1c} (HR=1.34, 95% CI=1.18-1.53), and AER (HR=1.56, 95% CI=1.41-1.72). Although results were similar when the MDRD formula was used, this time men appeared at increased risk compared to women and HDL cholesterol emerged as a protective factor. Diabetes duration (HR=1.03, 95% CI=1.01-1.06), HbA_{1c} (HR=1.49, 95% CI=1.32-1.68) and AER (HR=1.46, 95% CI=1.01-2.10) also predicted MA, whereas this model also included diastolic blood pressure (HR=1.03, 95% CI=1.01-1.27) and white blood cell count (HR=1.15, 95% CI=1.05-1.27). Predictors of severe eGFR decline by CG included insulin dose per body weight (HR=0.12, 95% CI=0.02-0.64), hypertension (HR=2.78, 95% CI=1.40-5.52), non-HDL cholesterol (HR=1.013, 95% CI=1.01-1.02), fibrinogen (HR=3.24, 95% CI=0.84-12.46), and AER (HR=1.40, 95% CI=1.16-1.69). Similar results were obtained using the MDRD formula. Conversely, male participants, those with higher HbA_{1c}, non-HDL, white blood cell count and AER were at increased risk of ON incidence.
Conclusion: While similar risk factors for renal function decline and albuminuria were seen, the differences, e.g. the protective effect of insulin dose for eGFR, merit further evaluation and have clinical implications in type 1 diabetes. These results also underscore the importance of glycemic, lipid and blood pressure control. Furthermore, our findings highlight the difficulty of accounting for gender differences in estimating GFR with current formulae.

No conflict of interest

D-0603

GLUT2 transcriptional regulation by PPAR-gamma in kidney of diabetic animals and insulin or phlorizin treated diabetic animals

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Introduction: The extracellular glucose concentration in proximal renal tubule is increased by elevations of glycemia and renal glucose reabsorption in diabetes mellitus. Increased expressions of GLUT2 and SGLT2, as well as augmented production of extracellular matrix proteins by mesangial cells could collaborate to development of glomerulosclerosis. We have already investigated the effect of insulin and phlorizin and demonstrated that chronically (6 days of treatment) both insulin and phlorizin downregulated GLUT2 expression, which returned to non diabetic levels, and definitely points out the plasma/interstitial glucose concentration as the key regulator of this gene (Freitas,HS;Nephron Physiology,2007). These results indicate a transcriptional control was involved, and an important transcriptional factor, PPAR-gamma, was indentified and characterized in GLUT2 gene promoter.
Aim: The aim of present study was to investigate the role of this transcriptional factor in kidney of diabetic rats, insulin or phlorizin treated diabetic rats.
Methods: We studied 3 month old Wistar rats, which were randomly allocated into non diabetic (C), diabetic (D), diabetic treated with saline (DS), insulin (DI–1, 4 and 6 days of treatment with daily injection of insulin) or phlorizin (DP–1, 4 and 6 days of treatment with daily injection of phlorizin). Diabetes was induced by single endovenous dose of alloxan (38 mg/Kg). The mRNA of PPAR-gamma was analyzed by RT-PCR. The PPAR-gamma binding activity of nuclear protein into GLUT2 promoter was analyzed by EMSA (Eletrophoretic Mobility Assay)
Results: In comparison to C animals, D rats showed: hyperglycemia, polyuria, glycosuria without ketonuria, increased PPAR-gamma mRNA content and binding activity of nuclear protein into GLUT2 promoter. In comparison to DS animals, the DI animals showed: a) reduction of glycemia in DI rats 10% (1 day), 22% (4 days) and 48% (6 days); b) progressive increase of body weight 2% (1 day), 5,4% (4 days) and 24% (6 days); c) decrease of PPAR-gamma mRNA content after 1, 4 and 6 days and decrease of the PPAR-gamma binding activity of nuclear protein into GLUT2 promoter, after 1, 4 and 6 days of insulin treatment; d) decrease of PPAR-gamma mRNA content after 6 days of phlorizin treatment, decrease of the PPAR-gamma binding activity of nuclear protein into GLUT2 promoter, after 1, 4 and 6 days of phlorizin treatment.
Discussion/conclusion: The present study showed that PPAR-gamma plays important role in the GLUT2 gene regulation, which was demonstrated by increased PPAR gene expression and binding activity into GLUT2 promoter in diabetic rats. These data suggest that in insulin and phlorizin treatment PPAR-gamma could be an important transcriptional regulator of GLUT2 gene and probably acts as mediator on GLUT2 gene in renal cortex of diabetic rats.

No conflict of interest

D-0604

Levels of proinflammatory cytokines in patients with different stages of diabetic nephropathy

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Background and aims: Diabetic nephropathy is one of the main causes of morbidity and mortality in patients with type 1 diabetes. Nevertheless pathogenesis of diabetic nephropathy is studied incompletely. The activation of inflammation could play a role in its pathogenesis. The aim of this study was to evaluate the serum levels of proinflammatory cytokines IL-6, IL-1ß, TNFa in patients with type 1 diabetes with different stages of diabetic nephropathy.
Materials and methods: We measured a serum concentration of cytokines IL-6, IL-1ß, TNFa by immunochemical biochip array technology analyzer EVIDENCE - EV180, in 66 patients with type 1 diabetes - 23 patients without microalbuminuria (age 30,0 ± 2,03 years, diabetes duration 7.1 ± 0.97 years), 22 patients with microalbuminuria (age 33,3 ± 2,5 years, diabetes duration 15.0 ± 1.59 years), 21 patients with proteinuria (age 31,2 ± 2,48 years, diabetes duration 18.27± 1.79 years). Control group included 20 subjects without diabetes mellitus and renal diseases (age 32,2 ± 1,06 years). Statistical analysis was performed using Student test.
Results: We found increased levels of proinflammatory cytokines in a serum of patients with type 1 diabetes with more severe stages of diabetic nephropathy. Levels of IL-6, IL-1ß, TNFa were: in patient group without microalbuminuria - 7.37 ± 3.55 pg/ml, 2.17 ± 0.61 pg/ml, 21.58 ± 8.48 pg/ml, in patient group with microalbuminuria - 12.44 ± 6.01 pg/ml, 5.67 ± 3.78 pg/ml, 24.85 ± 7.58 pg/ml, in patient group with proteinuria - 40.46 ± 15.44 pg/ml, 7.7 ± 3.36 pg/ml, 47.27 ± 15.6 pg/ml, in control group - 2.4 ± 0.76 pg/ml, 1.66 ± 0.17 pg/ml, 6.1 ± 0.58 pg/ml, respectively. P<0,05 between patients with proteinuria and control group (for all cytokines), and between group with microalbuminuria and control group (for cytokines IL-6 and TNFa).
Conclusion: Increased levels of proinflammatory cytokines may reflect an activation of inflammation in patients with diabetes mellitus and could contribute to the pathogenesis of diabetic nephropathy.

No conflict of interest

D-0605

Insulin infusion induces a reduction in transforming growth factor ß, PAI-1 and ICAM-1: implications for diabetic nephropathy

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Transforming growth factor ß (TGFß) is a key mediator of the pathogenesis of diabetic glomerulopathy. In addition, it regulates the gene expression of PAI-1 which is fibrogenic and may also be involved in this process. ICAM-1 is a pro-inflammatory adhesion molecule whose concentrations predicted the occurrence of nephropathy in the DCCT study. In view of the anti-inflammatory action of insulin, we hypothesized that insulin suppresses the concentration of TGFß, PAI-1 and ICAM-1 in patients with type 2 diabetes (T2DM). Ten patients with T2DM were infused with 2U/h of regular insulin and 100 ml of 5% dextrose with KCl (10 mmol/h) for 4h. These patients were also infused with 5% dextrose or saline on two separate days. Blood samples were collected at 0,2,4 and 6h. Blood glucose concentrations were similar on all 3 days. Insulin infusion led to a significant reduction in TGFß concentrations at 2h by 25±5% ($p<0.05$); this was maintained at 4h. TGFß concentrations reverted towards the baseline at 6h. There were parallel reductions in plasma concentrations of PAI-1 and ICAM-1. There was no significant change in these mediators following dextrose or saline infusions. We conclude that insulin suppresses TGFß and two other inflammatory molecules involved in the pathogenesis of diabetic glomerulopathy. It may thus have a role to play in the prevention of diabetic nephropathy.

No conflict of interest

Experience with alternative therapies

D-0606

The implementation of Helium-neon laserotherapy in complex treatment of diabetic angiopathy of lower extremities

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Background and aims: The aim of our study to assess changes of blood coagulation among type 2 diabetic patients with angiopathy of lower extremities after treatment with 5 days laser course.
Materials and methods: 700 patients (350 male, 350 female) with Type 2 diabetes were recruited during 9 years and had the following characteristics: age 40-65, fasting plasma glucose (FPG) 5.89±0.44 mmol/l. Fibrinogen A (FA), prothrombin index (PI), haematocrit (Ht), blood coagulation time (BCT), platelets aggregation time (PAT) were increased. Patients were randomized into 2 groups, one group patients received treatment of 15 days heparin (H) course while the second group received treatment of 5 day laser (L) course. H group patients received heparin by the following plan: 3 days-20000 U, 3 days-15000 U, 3 days-10000 U, 3 days-5000 U, 3 days-2500. Intravenous laser course was performed in dosage of 2-5 MVt, increasing the time gradually, from 15 minutes to 30 minutes. The reovasographic examination was performed in both groups. All patients were treated with oral hypoglycemic agent gliclazid 80 mg twice-daily, but during the last year with gliclazid 30 mg MR (Servier, France) once or twice- daily.
Results: After treatment with 5 days laser course there were significant reductions in FA 90 %, PI 87 %, Ht 82 %, BCT 58 %, PAT 84 %. In H group

after 5 days there were no significant changes. After 15 days in H group there were significant changes in parameters: FA 97 %, PI 94 %, Ht 92 %, BCT 78 %, PAT 93 %. After the laser course a significant improvement in blood circulation of lower extremities was assessed by reovasography in 71% patients, while in H group the improvement was in 28% patients.

Conclusion: Our data support that 5 days course of treatment with laser (on treatment with oral hypoglycemic agent Gliclazid 30-60 mg/Diabeton MR-Servie/) is more effective than 5 days heparin course among Type 2 diabetic patients with angiopathy of lower extremities.

No conflict of interest

D-0607

Anti-atherosclerotic potential of leaves of Cassia auriculata L. in experimental diabetes

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Aims: Cardiovascular diseases constitute the main causes of morbidity and mortality in diabetic patients. Diabetes mellitus is very often associated with atherogenic lipid profile, increased oxidative stress and endothelial dysfunction that can develop atherosclerosis which in turn leads to the development of cardiovascular diseases. Medicinal plants with reputed traditional use to treat cardiovascular diseases may provide valuable drugs. Therefore, the present study was designed to evaluate the anti-atherosclerotic potential of aqueous extract of *Cassia auriculata* L. leaves in streptozotocin (STZ)-induced diabetic rats.

Methods: The rats were rendered diabetic by STZ (45 mg/kg body weight, intraperitoneal). *C. auriculata* extract was orally administered to diabetic rats at a dose of 100, 200 and 400 mg/kg body weight per day for a period of 21 days. Fasting blood glucose (FBG), lipid profile parameters (triglycerides, total cholesterol, high-density lipoprotein, low-density lipoprotein, apolipoprotein A1 and apolipoprotein B), lipid peroxidation and markers of endothelial dysfunction {oxidized low-density lipoprotein (OxLDL), nitric oxide (NO), vascular cell adhesion molecule-1 (VCAM-1) and fibrinogen} were estimated at the end of the experiment. The ratio of LDL and Apo B was used to determine small, dense LDL. Histopathological studies were also performed in heart tissue.

Results: The extract produced significant reduction in the levels of FBG in a dose dependant manner. Treatment with the extract (400 mg/kg body weight) exhibited significant reversal in the altered lipid profile with significant decreased level of small, dense LDL in diabetic rats. The lipid peroxidation was found to be significantly suppressed in extract-fed diabetic rats. The significant reduction in the levels of OxLDL, VCAM-1 and fibrinogen with a concomitant elevation in NO level was observed in diabetic rats following supplementation with the extract. Histopathogical examination of heart sections from extract-treated diabetic rats revealed reversal of fatty change towards normal.

Conclusion: It is evident from the data that *C. auriculata* aqueous leaf extract exerts anti-atherosclerotic effect in STZ-induced diabetic rats and this suggests that the extract may help to prevent the progression of cardiovascular diseases.

No conflict of interest

D-0608

Antihyperglycemic actions of Ocimum sanctum extract are associated with enhancing tissue glucose utilization and delaying carbohydrate digestion and absorption

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Aims: Previous studies on ethanol extract of *Ocimum sanctum* leaves have shown it to flatten the glucose tolerance curve in type 2 diabetic rats, and its antihyperglycemic activity in the postprandial state indicates that the extract may interfere with the glucose absorption in the gut. The present study aims to explore the mechanism of its antihyperglycemic activity, specifically related to the inhibition of carbohydrate digestion and absorption in the gut and tissue glucose utilization.

Methods: The dried powder leaves of O *sanctum* were extracted with 80% ethanol. The rats were made type 2 diabetic by intraperitoneal injection of streptozotocin (90 mg/kg bw) to 48 hours old pups. Sucrose malabsorption was evaluated in twenty hours fasted type 2 diabetic rats by measuring the amount of sucrose remaining in six different parts of gastrointestinal tract after sucrose load (2.5 g/kg bw). Inhibition of glucose absorption in the gut was evaluated using *in situ* perfusion of small intestine. For evaluation of disaccharidase activity the extract was fed to 20 h fasted rats. After 60 min, rats were sacrificed and small intestine was isolated and homogenized. The homogenate (20 µl) was incubated with 40 mmol/l sucrose at 37 °C for 60 min. Disaccharidase activity was calculated by glucose converted from sucrose as µmol-mg glucose/protein/h. Glucose uptake and insulin action were evaluated in 3T3-L1 cells.

Results: When extract of *O sanctum* was administered simultaneously with the sucrose load, the residual sucrose content in the gastrointestinal tract was increased significantly ($p<0.01$), especially in the upper intestine at 30 min, in the whole intestine as well as cecum at 1 and 2 h. At 4 h sucrose was not detected in the gut in both groups. The intestinal glucose absorption was almost constant during 30 min of perfusion with glucose. When extract was supplemented with the glucose solution, the percentage absorption of glucose was decreased by 13 - 19% during whole perfusion period ($p<0.05$). It inhibited disaccharidase (sucrase) activity significantly ($p<0.05$) in diabetic rats compared to control. Extract significantly enhanced glucose transport compared to control (no insulin incubation, $p<0.05$). The enhancing effect of this extract was further increased by the presence of 10^{-9} M insulin ($p<0.01$). The extract significantly increased pancreatic insulin ($p<0.05$) and liver glycogen content ($p<0.05$) in type 2 diabetic compared to control group in 28 days feeding experiment.

Conclusion: The antihyperglycemic activities of *O sanctum* in type 2 diabetic rats are mediated at least partly via enhancing glucose uptake in adipocytes, storage of hepatic glycogen and delaying intestinal carbohydrate digestion and absorption.

No conflict of interest

D-0609

The effects of chromium histidinate on renal function, oxidative stress and heat shock proteins in fat-fed and streptozotocin-treated rats

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Background: Chromium is an essential element for carbohydrate, fat and protein metabolism. The therapeutic potential of chromium histidinate in the treatment of diabetes was elucidated.

Objective: The present study was conducted to investigate the effects of chromium histidinate (CrHis) on serum parameters of renal function and, oxidative stress markers [malondialdehyde (MDA) and 8-isoprostane], and heat shock proteins (Hsp60 and Hsp70) expression in rats.

Methods: The male Wistar rats (n=60, 8 w-old) were divided into four groups. Group I received a standard diet (12 % of calories as fat); Group II were fed standard diet and received CrHis; Group III received a HFD (40 % of calories as fat) for 2 weeks and then were injected with streptozotocin (STZ) on day 14 (STZ, 40 mg/kg i.p. HFD/STZ); Group IV were treated as group III (HFD/STZ+CH) but supplemented with 110 mcg CrHis/kg bw.d. Oxidative stress in kidney of diabetic rats was noted by an elevation in levels of MDA and 8-isoprostane. The protein concentrations of Hsp60 and Hsp70 in the renal tissue were determined by Western blot analyses.

Results: CrHis supplementation lowered kidney concentrations of MDA, 8-isoprostane levels, serum urea-N, creatinine, and reduced the severity of glomerular sclerosis ($P < 0.0001$) in STZ treated group (diabetes induced group). The expression of heat shock proteins, Hsp60 and Hsp70 was lower in STZ group that received CrHis than group that did not receive CrHis. No significant effect of CrHis supplementation on overall measured parameters was detected in Control group.

Conclusion: Chromium histidinate significantly decreased lipid peroxidation levels and heat shock proteins expression of kidneys in experimentally induced diabetes (Group IV) in rats. This study supports the efficacy of CrHis in reducing the renal risk factors and impairment due to diabetes.

Conflict of interest:
Stock ownership: James R Komorowski, Nutrition21 Inc, Purchase, NY, USA
Employee: V.Juturu and JR Komorowski, Nutrition21 Inc, Purchase, NY, USA
Commercially-sponsored research: K. Sahin, Research Funding from Nutrition21 Inc. Purchase, NY, USA

D-0610

Emblica officinalis improves glycemic status and oxidative stress in STZ induced type 2 diabetic model rats

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Background and aims:. Emblica officinalis belonging to the family of Phyllanthaceae widely cultivated throughout Indian subcontinent. Fruits of this plant have been demonstrated to possess several medicinal values. Based on the mass use of the fruit, the study was undertaken to evaluate the antidiabetic & antioxidant activities of Emblica officinalis using normal & STZ induced diabetic rats.
Materials and method: Male Long-Evans rats bred at BIRDEM animal house were used. Type 2 diabetes was induced by a single ip injection of STZ to 48 hours old pups & 3 months later after confirming with an OGTT type 2 rats were selected for experiment. The rats were divided into four groups (n=6-8 in each group): i) Control group, normal rats receiving water (NWC) ii) Type 2 diabetic control receiving water (T2WC) iii) Type 2 diabetic treated with glibenclamide (T2GT) (5 mg/kg bw) iv) Type 2 diabetic treated with aqueous extract of fruit pulp of Emblica officinalis, (T2AE) at a dose of 1.25g/kg bw. The extract & glibenclamide were fed orally for 8 weeks with a single feeding. Blood was collected by cutting the tail tip on 0 & 28 days & by decapitation on 56 day. The parameters measured were: serum glucose (glucose-oxidase), serum insulin (ELISA), serum lipids (enzymatic-colorimetric), serum ALT (UV method) & serum creatinine by (colorimetric) methods. Packed red cells were used for the estimation of malondialdehyde (MDA) by thiobarbituric acid method & reduced gluthathion (GSH) by the method of Beutler et al.
Results: Four weeks administration of aqueous extract of *E. officinalis* improved oral glucose tolerance in Type 2 rats. Postprandial serum glucose rose by 62%, 122%, 148% & 64% in NWC, T2WC, T2GT & T2AE groups respectively. Oral consumption of *E. officinalis* for 8 weeks caused significant ($P<0.007$) reduction of fasting serum glucose (FSG) level compared to 0 day. FSG also reduced significantly ($P<0.002$) in T2GT group. No change was in total cholesterol but triglycerides level decreased 14% by feeding *E. officinalis.* Eight weeks treatment with *E. officinalis* did not improve serum insulin level (SIL) (serum insulin Mean$\pm$SD; ng/ml: 0.38$\pm$0.17 in T2AE vs 0.24$\pm$0.13 in T2WC group). SIL remained unchanged in NWC group. No significant change was noticed in serum ALT & creatinine level in any groups. Erythrocyte MDA level was significantly higher in T2WC compared with NWC group ($P=0.025$). Orally administrated aqueous extract of *E. officinalis* reduced erythrocyte MDA level although nonsignificantly ($P<0.07$). Erythrocyte GSH content was found to be increased significantly ($P<0.05$) upon *E. officinalis* treatment.
Conclusion: The study revealed that aqueous extract of *E. officinalis* improves glycemic status in type 2 diabetic rats, which is probably mediated by extrapancreatic action. It also has strong antioxidant activity that reduces the oxidative changes induced by STZ administration.

No conflict of interest

D-0611

Hypolipidemic effect of Trigonella foenum-graecum in type 2 diabetic rats

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Aims: *T foenum-graecum* seed has earlier been shown to have antihyperglycemic properties in type 2 diabetic rats. In the present work, we have investigated the chronic effects of the seed on serum fructosamine, non-esterified fatty acid (NEFA), serum lipids, platelet aggregation and total antioxidant status (TAS) in type 2 diabetic rats.
Methods: Type 2 diabetes was induced by single intraperitoneal injection of streptozotocin (90 mg/kg body weight) to 48 hours old pups. The soluble dietary fibre (SDF) fraction from the seed of *T foenum-graecum* was prepared by the Theander and Westerlund method. The rats (n=20) were fed with the extract (1.25 g/kg body weight/5 ml water) twice daily for 28 days. The control rats (n=20) were fed only with deionized water. Blood was collected at the beginning of the study period from tail tips and at the end from abdominal aorta. Serum fructosamine and NEFA were measured by colorimetric and lipids by enzymatic method. Platelet aggregation was measured by Platelet aggregometer. Serum insulin was measured by rat insulin kit.
Results: *T foenum graecum* extract significantly lowered Serum glucose ($p<0.01$) and fructosamine ($p<0.05$) levels. However, serum insulin did not differ significantly between the extract fed and control groups. Total antioxidant status (TAS) was increased by 1.4 fold compared to type 2 diabetic control group ($p<0.05$). In addition, atherogenic lipids (TG and total cholesterol) and NEFA levels were lowered 56%, 21% and 56% respectively compared to control ($p<0.01$). The level of HDL-cholesterol increased significantly ($p<0.05$). The extract showed a lowering tendency of platelet aggregation in type 2 diabetic rats after 28 d administration ($p=0.055$). It did not show any effect on the content of pancreatic insulin; however, it increased hepatic glycogen as compared to control.
Conclusion: the present study has demonstrated that extract of fenugreek has promising antihyperglycemic and hypolipidemic effects. It also has a tendency to reduce platelet aggregation in diabetic rats. Fenugreek therefore represents a possible dietary adjunct for the treatment of diabetes.

No conflict of interest

D-0612

Effect of Chinese herbal medicine YuQuiQing on the upregulation of chemokines induced by AGEs

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Aims: Previous work showed that advanced glycosylation end products (AGEs) increased the expression of chemokines in human renal mesangial cells (HRMCs). The aim of this study was to further investigate the effect of a Chinese traditional drug YuKuiQing on the upregulation of monocyte chemoattractant protein-1 (MCP-1) and fractalkine (FKN) induced by AGEs.
Methods: HRMC cultured in the serum-free medium was incubated with AGE-BSA in the presence or absence of neutralizing anti-MCP-1 and anti-FKN antibody (Ab). HRMC incubated with AGE-BSA was cultured in the medium containing rat serum or special YuKuiQing serum which prepared by using Chinese herbal medicine serum pharmacological approach. The capacity of monocytes transmigration to HRMC was detected with a transwell system. The expression of MCP-1 and FKN mRNA in HRMC were analyzed by RT-PCR, and the content of MCP-1 and FKN in the supernatant of HRMC was measured by ELISA.
Results: 1. The number of monocytes transmigration to HRMC treated with AGE-BSA was significantly higher than control group (17.8±2.04 vs 0.7±0.84, $P<0.01$). But that of anti-MCP-1 Ab (8.6±1.14, $P<0.01$) and anti-FKN Ab (2.2±1.10, $P<0.01$) group was lower than AGE-BSA group. 2. The number of monocytes transmigration to HRMC treated with AGE-BSA in the presence of different concentration of rat serum (0.313%, 0.625%, 1.25%) was increased dose dependently (19.6±0.89, 23.6±1.14, 27.2±0.84, $P<0.05$). But those of YuKuiQing serum groups (17.0±1.00, 14.8±0.84, 12.0±1.22, $P<0.01$) were decreased compare to similar concentration of serum. 3. The mRNA expression (FKN: 1.03±0.05 vs 0.22±0.05, MCP-1:0.74±0.05 vs 0.26±0.03, $P<0.01$) and the supernatant content (FKN: 289.49±9.77 vs 20.15±8.84 pg·L^{-1}, MCP-1: 33.47±3.14 vs 16.19±0.66 pg·L^{-1}, $P<0.01$) of MCP-1 and FKN in the HRMC treated with AGE-BSA was significantly higher compared to control group. 4. The mRNA expression (FKN: 0.950±0.051 vs 1.106±0.045, 0.885±0.041 vs 1.148±0.044, 0.833±0.040 vs 1.199±0.044,$P<0.01$. MCP-1: 0.724±0.043 vs 0.800±0.060, 0.663±0.031 vs 0.836±0.055, 0.604±0.028 vs 0.856±0.053,$P<0.01$) and the supernatant content (FKN: 280.19±9.31 vs 310.87±10.70, 268.41±9.77 vs 332.57±9.31, 251.98±9.80 vs 343.73±6.33 pg·L^{-1}, $P<0.01$. MCP-1: 27.49±2.16 vs 33.69±3.24, 26.77±2.13 vs 34.03±3.31, 26.06±1.65 vs 34.72±3.01 pg·L^{-1}, $P<0.01$) of MCP-1 and FKN in the HRMC treated with AGE-BSA in the presence of different concentration of YuKuiQing serum was lower than control serum.

Conclusions: 1. AGE-BSA enhance the capacity of MCP-1 and FKN to induce monocytes transmigration to HRMC, which are inhibited by anti-MCP-1 and anti-FKN antibody partially. 2. YuKuiQing markedly reduce the upregulation of MCP-1 and FKN induced by AGE-BSA, and attenuate the capacity of MCP-1 and FKN to induce monocytes transmigration to HRMC, These results indicate that YuKuiQing might play its role of reno-protection via inhibition of MCP-1 and FKN.

No conflict of interest

Foot care 1

D-0613

An audit of the risk factors of developing MRSA in diabetic foot patients in Kingsmill Hospital, Mansfield

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Aim: To analyze risk factors for Methicillin resistant Staphylococus Aureus in diabetic foot ulcer (DFU) patients and reaudit after introducing remedial measures.
Method: A retrospective audit of 44 patients at Kingsmill Hospital, Mansfield. Using clinical coding and electronic discharge systems the duration of hospital stay, the number of hospital admissions, surgical procedures, vascular procedures and MRSA culture results of DFU patients admitted for surgical procedures between March and November 2008 and 22 patients between November 2008 and February 2009, after the introduction of a diabetic foot coordinator (DFC) and a multidisciplinary team meeting (MDT) were analyzed.
Results: From April to December 2008 there were 22 MRSA bacteraemias, 12 with DFU. The odds ratio for multiple procedures compared to single procedures being MRSA positive is 24 (95% confidence interval (CI) 4.20-137.27, p=0.000028).The duration of stay (p=0.5028) and the number of hospital admissions (p=0.424) increasing the likelihood of a patient becoming MRSA positive is not statistically significant. The odds ratio of patients having multiple procedures compared to single procedures and whether the patient had vascular procedures to improve peripheral circulation to their feet e.g. angioplasty is 5 (95% CI 0.99-25.22, mid-p=0.03). The odds ratio of having vascular procedures prior to surgery reducing the number of surgical procedures from multiple to single is 3 (95% CI 0.15-59.89, mid p=0.2857).
After the appointment of the DFC and introducing MDT there have been no further MRSA bacteraemias in DFU patients. From November 2008 to February 2009, 3 out of 22 patients were MRSA cultures positive. These interventions resulted in a reduction of patients requiring multiple procedures (from 31.8% before November to 18.2% after). The odds ratio of being MRSA positive after November was 4.38 (95% CI 1.12-17.05, Fisher exact value=0.0219). The odds ratio of having multiple procedures after November is 2.10 (95% CI 1.13-17.05).
Conclusions: Before November patients were initially managed by general surgeons who performed surgical intervention. Patients having multiple surgical procedures needed vascular procedures to improve peripheral limb circulation (OR=5). This emphasised the need of correct classification of the DFU (e.g. vascular or neuropathic). Early revascularisation prior to surgical interventions reduced the need of multiple procedures through expert vascular assessment prior to surgery permitting definitive earlier surgery rather than multiple procedures due to poor peripheral circulation. The introduction of a DFC enabled early involvement of vascular specialists and reducing MRSA and multiple procedures. The number of admissions and duration of stay did not increase risk of MRSA suggests that infection control procedures in the wards and diabetic foot clinic are working.

No conflict of interest

D-0614

Risk factors, prevalence and quality of care of diabetic foot disorders in Egyptian subjects with diabetes mellitus

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Introduction: Podiatry services are almost absent in Egypt. A specific Centre initiated by an IDF-BRIDGES Grant provides foot care, patient's education and formation of Health Care Providers (HCPs).
Aim: The aim of the present work was to assess the magnitude of the problem by delineating the risk factors, prevalence, and quality of care of diabetic foot disorders (DFD) in Egyptian subjects with diabetes mellitus (DM).
Subjects: 1290 Egyptian subjects with DM were included in the study. The mean age was 57.6±10.3 years and 48.3% of them were males.
Methods: Examination included the overall conformation of feet & ankles and common deformities or callus; skin temperature, joint mobility, vascular status, ankle brachial index; neurological status including vibration perception threshold and 10g monofilament testing and screening for shoe-foot mismatches.
Results: The mean duration of DM was 12.5± 8.8 years in those with DFD vs. 9.6 ± 7 in the others (p=0.002); 16.2± 8.7 in those with ulcers vs. 10.7 ± 7.5 in the others (p<0.001); 14.9±9.3 in those with PAD vs. 10.9 ±7.7 in the others (p<0.001); 14.1± 8.6 in those with neuropathy vs. 9.7±7 in the others (p<0.001) and 18.3 ±10.3 in those with amputation vs. 10.9±7.6 in the others (p<0.001). History of foot ulcers was found in 9.8% of patients, 12% in males and 6.9% in females (p<0.001), 22.4% in illiterates vs. 3% in high school graduates (p<0.001). Active ulcers were detected in 5.3% of patients, 6.1% of males & 4.6% in females (p=0.36). Amputation was found in 4.4%, 6.1% & 2.9% respectively (p=0.007). Neuropathy in 34.8%, 35.9% & 33.9% respectively (p= 0.54). Fungal foot infection in 20.8%, 21.6% & 20.3% respectively (p=0.64). Foot deformities were found in 30.4%, 37.4% & 24.7% respectively (p<0.001). Callus was present in 28.7%, 29.2% & 28.3% respectively (p= 0.78). Limited mobility of the joints was detected in 26.7%, 31.7% & 22.6% respectively (p= 0.004). The crowding index did not show a significant impact on the prevalence of DFD. Only 4.8% of the screened cohort has been subjected to any therapeutic patient education (TPE) related to foot care. Besides, only 7.2% of them had their vascular status assessed, 7.2% their neurological system examined, and only 14% have ever been inspected for the state of their feet. Among male patients with DFD, 67.3% were smokers and/or ex-smokers vs. 32,6% non-smokers (p=0.029). Presence of IHD, hypertension or stroke did not affect significantly the prevalence of DFD. Inappropriate foot-wear was observed in 54.4% of the studied cohort, 38.2% of males & 67.7% of females (p<0.001). The glycemic control was worse in subjects with DFD (HbA1C 11.6±4.5%) than in the others (8.5±4.5%) (p<0.001).
Conclusion: From the present study one can deduce that a mosaic of factors is contributing in the high prevalence of DFD in our community. Most of these factors are manageable and need comprehensive preventive strategies, committed HCPs and patient's awareness and empowerment.

No conflict of interest

D-0615

Foot care in Cameroon

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Background: With 10 years of working with renowned hospitals in Cameroon like the 2 major Baptist hospitals diabetes clinics and then local clinics as well as visiting other hospital settings, I have not come across a unit with special attention given to foot care and vascular assessment. There is no single podiatrist specialist, and diabetes as well as obesity trends are sharply increasing.
Method: Reviewing foot care and vascular needs of the diabetics in Cameroon. Retrospective study on cross section of care in relation to diabetes and foot care/vascular assessment interpreted.

Result: Few clinics give diabetes care and often run out of diabetes supplies. Muddy road networks often discourage diabetics in the hinterlands accounting for non compliance and poor sugar results and subsequently foot ulcers which are on the rise. There are no Centres where either diabetics' feet or vascular systems are assessed.
Conclusions: Carrying out amputations for limbs that can be salvaged through early counseling, education, empowerment, early vascular assessment, is inhuman. More effort in education, sensitization, proper counseling and empowerment are very vital, cheap and efficient tools that can be used with excellent result but the prevailing poverty is affecting both the health care professionals in effectively carrying out the programs. 35% Cameroonian now are overweight and 600,000 are diagnosed with diabetes (www.3four50.com) implying that this is time that Cameroonians need diabetes experts most.

No conflict of interest

D-0616

Admission for diabetic foot ulceration in a specialized diabetes unit in sub-saharan africa: an 8-year trends study

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Aims: Diabetic foot disease, a common complication of diabetes is a real public health issue. The aim of this work was to study the evolution of admissions, hospital resources utilization and outcomes of diabetic patients with foot ulcer in Cameroon, and to depict the trends for the period 2000-2007.
Methods: Admission and discharge registers of the diabetes and endocrine unit of the Yaounde Central hospital, Cameroon were reviewed for the period 2000-2007. Data were collected on the status for diabetes, presence of foot ulcer, age, and sex, duration of hospitalization, amputation and deaths. Data were analyzed with the use of SPSS® v.9 and appropriate statistical techniques.
Results: 1841 patients were diabetics including 240 with foot ulcer, giving a prevalence rate of 13% [(95% CI): 11-15%]. This prevalence varied significantly by year of study. The proportion of men among those with foot ulcer was higher than that for women (67% vs. 33%, c^2=11.64). The average age of the population of diabetics was 57 years, with not significant difference by status for foot ulcer. The average age of the participants without ulcer varied significantly by year of study. Male sex was the only significant determinant of admission for foot ulcer: odd ratio, OR (95% CI): 1.68 (1.25 -2.27). The average duration of hospitalization for patients with foot ulcer was 19.36 days. It was significantly higher than that for diabetic patients without foot ulcer. The average duration of hospitalization decreased significantly according to the years of study in both groups. Diabetic patients with foot ulcer consumed 2.16 (95% CI: 1.85-2.45) times more hospital resources than those without. During the study period, 203 deaths were recorded in patients with diabetes in the service. The death rate was 5.8% (95% CI: 2.9-8.8%) in patients with foot ulcer and 11.8% (10.2-13.4%) in those without. The rate of amputation among patients with diabetic foot was of 16% (95% CI: 11-21%). This varied significantly by year of study.
Conclusions: This study suggests that the prevalence of the diabetic foot in hospital settings in our environment is rather high. Fuelled primarily by men, this complication is the leading cause of prolonged hospitalization and bed occupancy in patients with diabetes. Although it is associated with a lower death rate, at least one in every ten patients admitted for foot ulcer undergoes a lower extremity amputation during hospitalization.

No conflict of interest

D-0617

The diabetic foot: patient & provider tools

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Background: As a provincial program focused on improving the health of Nova Scotians living with diabetes (DM), the Diabetes Care Program of Nova Scotia (DCPNS) recognizes that foot problems are a major cause of morbidity and mortality for people with DM. NS data show evidence of high rate ratios for lower extremity amputation (LEA). In the age groups 29-39 and 40-49, people with DM are 34 and 73 times more likely than the non-diabetic population to have an LEA, respecitvely.
Aims: To address the growing burden of foot problems and related LEAs in persons with diabetes in Nova Scotia, through a province-wide initiative.
Methods: In May 2007, following roundtable discussions with foot care providers and stakeholders, the DCPNS released a discussion paper, The Diabetic Foot in Nova Scotia: Challenges and Opportunities. This document identifies issues and gaps in care that contribute to poor foot outcomes and outlines priority areas for improvement in 5 target areas: DM Centres; Physician and Other Healthcare Providers; Inpatient Care; Consumer Awareness and Education; and the Departments of Health and Community Services. A multidisciplinary Diabetic Foot Working Group was formed to address a number of recommendations from the foot document. Literature was reviewed, draft materials developed, and Advisory Council approval granted.
Results: A series of patient and provider foot care materials feature a traffic sign color/symbol identifying category of risk: Green-Low, Yellow-Moderate, and Red-High. The materials, including a Foot Care Questionnaire; Risk Assessment Form; Risk Stratification Form; Referral Algorithm; 3 Patient Risk Information Sheets; and Patient Decision Tree, were launched at the provincial Foot Forum in Spring 2009 targeting DM care providers (nurses, dietitians, foot care specialists, and others).
Discussion: The culmination of this work will lead to increased awareness of the diabetic foot, more standardized approach to the identification of the high/moderate risk foot, more streamlined referral, and consistent messaging to individuals with DM and among health care providers. Dissemination will focus across multiple health system sectors using a variety of media: professional newsletters, continuing medical education opportunities, and direct access through the DCPNS website. Work will continue on other recommendations from the foot document.

No conflict of interest

D-0618

Younger females get foot problem in Egypt in comparison to the UK

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Background and aims: Diabetic foot problem is associated with significant morbidity and mortality but this is often neglected in developing countries like Egypt. Therefore a diabetic foot service was started in the Zagazig University Hospital of Egypt in April 2008. The aim of this study was to compare profile of subjects attending this clinic and established Foot Clinic of Lancashire Teaching Hospital, UK.
Method: Subjects attending foot clinic between April 2008 and August 2008 at both centers were studied retrospectively and characteristics of patients who presented with active problem (new onset ulcer or Charcot Neuroarthropathy) were compared.
Result: 199 patients attended foot clinic in Egypt and 281 in the UK of which 24 and 55 had active foot problems respectively (Charcot Neuroarthropathy in 2 cases at each site). There was higher proportion of female with active foot problem in Egypt (70.8% vs 45.5%; p=0.05). Egyptian patients with active foot problem were younger (55.8 +/- 9.8 years vs 68.5 +/- 13.6 years; p <0.001) but duration of diabetes was similar (13.1 +/- 7.8 years vs 11.0 +/- 8.3 years; p = 0.3). Although most had type 2 diabetes, higher proportion were on insulin treatment in Egypt (91.7% vs 23.6%; p = 0.006). There was no difference in cardiovascular complications (37.5 % vs 40%) and smoking status (8.3% vs 5.5%).
Conclusions: This study shows that more females develop foot problem in Egypt at a younger age. This may be due to survival advantage of diabetic females and further studies are needed.

No conflict of interest

D-0619

Clinical characteristics on the patients with diabetic foot problem

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Background and aims: Diabetic foot problems are global burden and the consequences are major. There is an increase in amputation rates globally despite increased foot care education, research and prevention. This increasing trend has been attributed mainly to diabetes to failure of early detection of the risk group. The aim of this study was to express the prevalence of diabetic foot characteristics of diabetic patients that developed foot ulcer.
Materials and methods: This study was carried out in a district hospital, a secondary health care centre, which covers 270,7011 population. A total of 1875 diabetic subjects registered in the out patient department within a period of 35 months. Of these diabetic subjects 75 (M/F=46/29) presented with foot ulcer. We investigated the latter subjects for geographic location, family income, height, weight, mid-arm circumference (MAC), monofilament test, electrocardiogram (ECG), ophthalmoscopy, fasting blood glucose (FBG), fructosamine, lipids and micro-albumin creatinine ratio (ACR). Body mass index (BMI) was calculated as wt in kg/ht msq.
Results: The prevalence of foot ulcer among the diabetic population was 4%. Among them only 4% were from higher social class, whereas, 96% were either from lower middle or poor class. The urban subjects were only 40% and the rest 60% were either from rural or suburban communities. The mean (SD) of age was 52 (12)y, BMI 20.2 (3.8), and MAC 23.1 (2.7) cm. Their FBG and fructosamine levels were 12.4(6.0) mmol/l and 317 (118) micromol/l, respectively. A 10-g monofilament test could detect abnormal or absent sensation in 38.7% of the cases. Most importantly, the sensory impairment was found significantly associated with coronary heart disease ($p<0.04$) and retinopathy ($p<0.049$).
Conclusion: The study revealed that the prevalence of foot ulcer among the diabetes of Bangladesh is comparable to other countries. The prevalence was much higher in the low social class and in rural population. The monofilament test was found to be an important simple test for detecting early stage of impaired sensation related to foot ulcer.

No conflict of interest

D-0620

The prevalence of calcification of the pedal arteries in patients with disease of the foot in diabetes

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Aims: The mechanisms underlying the increased prevalence of medial calcification in diabetes are not understood. An association with distal symmetrical neuropathy has been reported in a number of small studies, and a particularly high prevalence was reported in two series of patients with Charcot's disease. The aim of this study was to attempt to confirm the high prevalences of calcification in Charcot's disease and to determine whether it is specific to that disorder by comparing the results with patients with other types of foot disease.
Methods: The prevalence of calcification was determined retrospectively in three groups of patients managed by a specialist diabetic foot service. Group A comprised those with an acute Charcot foot who were managed between 2002 and 2005, Group B comprised those managed in the foot service who had been diagnosed with osteomyelitis between 2002 and 2004, and Group C those who had had X-rays taken between 2002 and 2004 but who had neither osteomyelitis nor Charcot's disease. All X-rays were scored independently by three observers. All three observers were blinded as far as possible to the underlying diagnosis, with films from the three groups being mixed.
Results: There were 34 patients in Group A (Charcot), 53 in group B (osteomyelitis) and 35 in group C. There were no differences ($p>0.5$) in the mean age of the patients in the three groups (60, 72 and 68 years, respectively), the proportion of men (68%, 64% and 51%) and the prevalence of nephropathy (41%, 30% and 14%). The overall prevalences of calcification in the three groups were 53%, 66% and 54% ($p>0.05$). When all three groups were combined, the only factor associated with calcification on logistic regression analysis was duration of diabetes ($p=0.004$).
Discussion: The prevalence of arterial calcification in patients with foot disease was higher than the 40% previously reported in patients with neuropathy, but lower than that reported in other series of Charcot. As there was no difference in the prevalence of calcification between the three groups, it is concluded that the increase is not specific to Charcot's disease. It is possible that the increase in calcification in each of the three groups reflects the effect of preceding local inflammation, possibly by activation of the RANKL/OPG signalling system.

No conflict of interest

D-0621

Practical thermal monitoring solutions: empowering diabetic foot care teams for prevention of lower extremity complications

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The purpose of this abstract is to summarize recent developments in thermometry and associated initiatives regarding prevention of lower extremity complications in diabetes mellitus. This information will facilitate adoption of thermometry related prevention strategies by diabetic foot care teams. Prevention of foot ulcers by identifying individuals at high risk and treating for lower extremity complications may reduce number of amputations by 85%. Inflammation is a potential marker of neuropathic complications leading to diabetic foot ulcers and can be easily identified by temperature assessments of the affected limbs. The authors' research group have reviewed various thermological techniques relevant to the diabetic foot disease and emphasize the importance of using thermometry for lower extremities as a tool for supplementary evidence of neuropathy. Additionally, the authors' research has shown that skin temperature monitoring at home reduces re-ulceration rates by 4 to 10fold. Currently, the authors' are investigating thermometry in dynamic state to model thermal changes during activity of daily living, develop prediction model for wound healing and combining thermography with other imaging modalities to futher understanding about diabetic foot infections.
In three independent clinical trials our group investigated the efficacy of the thermometry for lower extremities, with the intent to reduce recurrence of ulceration. Educating patients about self-monitoring and providing a hand-held digital thermometer achieved significant reductions in re-ulceration. In a recent study by our group involving a clinical thermometry test, it is shown for the first time, the evidence of poor recovery times for the diabetic foot with neuropathy when assessing the foot under load. Diabetics with neuropathy show the highest 'delta temperature' i.e. difference between the temperature after 10 minute recovery period and baseline temperatures measured independently. A temperature deficit (due to poor recovery to baseline temperature) suggests degeneration of thermoreceptors leading to diminished hypothalamus mediated activity in the diabetic neuropathic group.
There is a growing body of evidence emerging from our group's work in this area to build a knowledge base in thermal measurements. The long term goal of this research is to further the role of thermometry and thermography in clinical care for the diabetic foot. There are incremental benefits from a well equipped foot care team, that includes patient education or counselling for self monitoring of their condition which has been shown to be successful.

No conflict of interest

D-0622

Diabetic foot problems in Mauritius

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Mauritius is an island in the Indian ocean and is a popular holiday destination. It has undergone rapid economic growth and as a consequence diabetes prevalence has increased by 40% between 1986 and 1997, and is still increasing, and affects close to 20% of the population over 30 years of age, and diabetic foot problems and lower limb amputations have increased.
Aim: To assess the scale of diabetic foot problems in Mauritius and the future impact of training health care professionals in the management of the diabetic foot.
Method: The Ministry of Health was successful in obtaining a grant from the World Diabetes Foundation and we[2,2,3] were invited to train health care professionals in diabetic foot care.

Results: Audit data showed that in 2007 there were 334 total amputations, 288 of which were diabetes-related and 139 of which were major amputations. 74% of the major amputations occurred in men. The average age for a major amputation was 63 years for males and 62 years for females. Data from 1995-1997 reported 5.8 major amputations per 100,000 population per year in Leicestershire compared to an estimated 10.7 major amputations per 100,000 population per year in Mauritius.
There are no established diabetes foot clinics on the island. Diabetics with foot ulcers are admitted under the general surgeons. There is only one vascular surgeon on the island who is a cardiac surgeon and there are no interventional radiologists involved in diabetes foot care. There is only one microbiologist and a podiatrist who had retired from Sheffield, UK, had recently been appointed. A patient who presented with a foot ulcer simply had the ulcer dressed and ointments such as iodine and gentian violet were sometimes used. Several ulcers assumed to be ischaemic or neuroischaemic were in fact entirely neuropathic with a good chance of healing with regular debridement and offloading. Offloading was not being offered and the health care professionals did not know how to do offloading casting. In addition the ideal material for the offloading cast is expensive and may not be a sustainable option. Cheaper options were discussed.
Discussion: During the week we spent in Mauritius we are glad to say that we managed to save some legs. We discussed the shortfalls with the Health Minister. There is a need for a dedicated diabetes foot team and the setting up of multidisciplinary diabetes foot clinics with close collaboration between the physicians and general and orthopaedic surgeons. There is an urgent need to recruit and train additional podiatrists. Radiologists could be trained to do lower limb angioplasties. Above all education and prevention of diabetic foot ulcers should be amongst the priorities. A foot clinic has now been set up and more feet have been saved. A re-audit of lower limb amputations is planned in 2010.

No conflict of interest

Guidelines, clinical care

D-0623

Comparative investigation of mortality in a population based study with type 2 diabetes in Germany (DIG) in comparison with the findings in ACCORD, ADVANCE and VATD

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Background and aims: Patients with type 2 diabetes (T2DM) have a higher risk of mortality than normoglycemic subjects. Recently published results of three megatrials with intensified glucose lowering have shown no beneficial effect on all cause mortality. However the mortality rate was low in the three trials. The Diabetes in Germany (DIG) study is a population based prospective observational study of patients with T2DM with a HbA1C level of 7% at baseline. The focus of this report was to compare the overall mortality of the DIG population to the outcome of the international studies ACCORD, ADVANCE and VATD.
Materials and methods: Two hundred and thirty eight general practitioners and diabetologist practices that represent a cross section of daily practice in Germany took part as investigators in this study. Each center recruited 10-30 consecutive patients with T2DM. Medical history, cardiovascular medication, risk factor profile, clinical and laboratory parameters and all cause mortality were collected by a standardized questionnaire. Exclusion criteria were: major cardiac event in the last 3 months, neoplasia in the last 5 years, heart failure NYHA IV or chronic renal failure. The total population consisted of 4,020 patients aged 35-80 years.
Results: In the DIG study after an average follow-up time of 3.7 years we had available data of 2.959 patients. The mean glycated hemoglobin level was 7.0% (SD1.2) and the average age was 61.5 (7.9) years. In comparison in ACCORD, ADVANCE and VATD the range of HbA1C levels and age at entry were higher (8.3% / 62.2 yrs; 7.5% / 66 yrs; 9.4% / 60.5 yrs). The corresponding annual mortality rates were 1.28; 1.85; 1.96 and in DIG 1.48.
Conclusion: Compared with the large outcome studies the annual all cause mortality rate in the DIG study with an average HbA1C level of 7.0% was in the same range despite striking differences in glycated hemoglobin levels. It looks like that in these multimorbid patients other risk factors such as blood pressure and lipid control are of dominant importance.

No conflict of interest

D-0624

Ethnicity and outcomes in a 20-week, randomized, controlled trial (TITRATE study)

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Background and aims: Insulin titration is essential for the management of type 2 diabetes. Race/ethnicity has been claimed a factor in outcomes of some therapies. We sought any differences in efficacy and safety for self-titration of once-daily insulin detemir between self-identified Whites (n=177) and African Americans (n=36).
Methods: Data were analyzed from the TITRATE study, a 20-week, randomized controlled trial that examined two FPG targets (3.9-5.0 mmol/l and 4.4-6.1 mmol/l) for the self-titration of once-daily insulin detemir for the treatment of type 2 diabetes.
Results: The mean duration of diabetes for Whites and African Americans was 8.2 and 9.0 years, respectively. Mean baseline HbA1c values were significantly lower for Whites than for African Americans (7.9% and 8.2%, respectively, p=0.02), but there was no significant difference in mean HbA1c changes at end of study (-1.11% and -1.02% for Whites and African Americans, respectively, p=0.48).
The proportion of subjects who reached HbA1c levels <7% at 20 weeks did not differ significantly between Whites and African Americans (62.1% [110/177] and 47.2% [17/36], respectively, [p=0.37 for the odds ratio of White vs. African American]). Similarly, the proportion of subjects achieving HbA1c levels =6.5% at 20 weeks also did not differ significantly (37.3% [66/177] and 25.0% [9/36], for Whites and African Americans, respectively [p=0.45 for the odds ratio of White vs. African American]). Mean weight-adjusted insulin doses at 20 weeks were significantly greater for Whites compared to African Americans (0.57 U/kg vs. 0.39 U/kg, p=0.004).
Major and minor hypoglycemic events were low (4.50 and 2.79 events/patient-year for Whites and African Americans, respectively. One major hypoglycemic event occurred (White subject, 0.01 events/patient-year). There were no significant differences in rates of all hypoglycemic events (Exact rate ratio for White vs. African American = 1.65, 95% CI [0.87, 3.12], Poisson regression p=0.12). The rate of nocturnal hypoglycemic episodes was greater for Whites than for African Americans (Exact rate ratio = 5.46, 95% CI [1.14, 26.03], Poisson regression p=0.03).
Conclusion: Once-daily self-titration of insulin detemir was safe and effective in Whites and African Americans. Although baseline HbA1c levels were lower in Whites, both groups showed similar reductions in HbA1c at end of study, and there were no statistical differences in the proportion of subjects in either group achieving glycemic goals. However, African Americans used smaller doses of insulin by end of study and had fewer nocturnal hypoglycemic events, suggesting that successful diabetes management should take into consideration cultural, racial and ethnic differences. Finally, we note that the number of African Americans in this study was small compared to Whites, and therefore further study with larger subject populations is warranted.

Conflict of interest:
Paid lecturing: Philip Raskin - Merck & Co., Novo Nordisk Lawrence Blonde - speaker or consultant for Abbott, Amylin Pharmaceuticals, AstraZeneca, Biodel Inc, Boehringer Ingelheim Pharmaceuticals, Inc, Bristol-Myers Squibb, Daiichi Sankyo, Eli Lilly and Company, GlaxoSmithKline, LifeScan, Merck & Co., Inc., Novartis Corporation, Novo Nordisk, Pfizer Inc, Roche and sanofi aventis
Advisory board: Philip Raskin - AstraZeneca, MannKind Corporation., Novo Nordisk, Inc., and Quigley Pharma Inc.
Employee: Titus Gylvin and Vatsala Karwe are employees of Novo Nordisk, Inc.
Commercially-sponsored research: Lawrence Blonde - Amylin Pharmaceuticals, Eli Lilly and Company, MannKind Corporation, Merck & Co., Inc., Novo Nordisk, Novartis Corporation, Pfizer Inc, Roche and sanofi aventis Philip Raskin - Amylin Pharmaceuticals, Bayhill Therapeutics, Biodel Inc., Boehringer Ingelheim Pharmaceuticals, Elixer Pharmaceuticals, Generex Biotechnology, Hoffmann-La Roche, Johnson & Johnson Pharmaceutical Research & Development, Keryx Biopharmaceuticals, MannKind Corporation, Novo Nordisk, Osiris Therapeutics Inc., Pfizer, Sanofi Aventis, and Tolerx

D-0625

Diabcare Middle Africa 2008 results: Use of current guidelines leads to overdiagnosis of central obesity in Africans with diabetes

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Background: Weight control is an important aspect of diabetes mellitus (DM) management. Local data are important in the interpretation and use of patient's measurements. No region-wise information is available on indices of obesity in sub-Saharan Africa. The Diabcare project provided an opportunity to source comparative data from six sub-Saharan African (SSA) countries.
Aim: To analyze anthropometric measurements from African countries and critically evaluate and compare such data with recommended critical guidelines on anthropometric data for diagnosis of obesity.
Methods: The Diabcare Middle Africa project was conducted in 2008. The project consisted essentially of obtaining clinical data from patient records, interviewing the patient and performing an HbA_1c test. Among the records obtained from each patient were anthropometric measurements of height, weight, waist circumference (WC) and hip circumference. Information was obtained from 31 centres in six SSA countries. The anthropometric indices were analyzed by country and for the whole group with particular attention to body mass index (BMI), waist circumference, and waist hip ratio (WHR) using criteria suggested by IDF and/or World Health Organisation (WHO).
Results: Information on height and weight was available for 2643 patients while 1879 patients had measurements on waist and hip circumferences. The regional mean (SD) BMI was 27.3 (6.0) $kg/m^{2.}$ Individual country averages ranged from 27.7 to 29.0 kg/m^2. The mean WC of the 2302 patients with available data was 94.2(13.2) cm and a range of 35-182 cm. Mean country WC averages ranged from 91.6(12.7) cm to 97.2 (14.7). Mean WHR was 0.9 (0.1) with a regional range of 0.5-1.67. Using IDF WC cutoff for European men (<94) and women (<80) respectively as recommended for Africans, 46.8% and 90.1% had truncal or central obesity. Of the women the range of prevalence of central obesity by this criterion was particularly high at 86.0% to 91.8%.
Conclusion: The diagnostic criterion for the prevalence of obesity in African men using the IDF criteria appears to be within expected limits. However the criterion for women appears to excessively over diagnose central obesity. Urgent region-wide and local prospective studies are required to fill the gap.

No conflict of interest

D-0626

The rate of patients achieving target levels for hyperglycemia, hypertension and hyperlipidemia in type 2 diabetes

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In our study group, "3H care" was established since 2002. The meaning of "3H care" is attaining and maintaining adequate control of Hyperglycemia, Hypertension and Hyperlipidemia. We evaluated the rate of patients achieving target levels by American Diabetes Association (ADA) for hyperglycemia, hypertension and hyperlipidemia after 1 year "3H care" for type 2 diabetes. This was a cross-sectional retrospective study of 200 type 2 diabetic patients first visited at the diabetic clinic of Dong-A university hospital. Outcome data included HbA1C, blood pressure, total cholesterol, HDL-C, LDL-C, triglyceride and percentage of patients achieving HbA1c <7%, blood pressure <130/80 mmHg, LDL-C <100 mg/dL, HDL-C >40 (50 in women) mg/dL and triglyceride <150 mg/dL. Two hundred patients were enrolled (male 106 (53%) and female 94 (47%). The mean age was 56.0±11.3 years, BMI was 24.3±3.4 Kg/m^2, duration of diabetes was 6.2±8.2 years and initial level of HbA1C was 8.6±2.1%. The prevalence of hypertension, hyperlipidemia and both were 45%, 43% and 24% respectively. After 1 year " 3H care", the HbA1C level was reduced to 7.3±1.6% and the percentage of those <7% was 52%. The HbA1C levels among different treatment groups were 6.0±0.4% (diet alone), 6.8±2.2% (oral agents alone), 7.9±2.5% (insulin alone), and 8.3±4.1% (insulin and oral agents). Those who achieved HbA1C <7% showed a trend of shorter duration of diabetes and lower initial HbA1C levels, but statistically was not significant. The percentages for blood pressure were 58% (systolic blood pressure) and 64% (diastolic blood pressure). The percentages of achieving targets of hyperlipidemia were 63.5% (LDL-C), 67% (triglyceride), 59.4% (HDL-C in men) and 20.2% (in women). In conclusion, there is good evidence that multifactorial treatment of the risk factors will have a dramatic effect on diabetic end points. But overall rates of achieving targets need to be much improved. We should start more early these multi-factorial control and should also maintain it continuously to improve the achievement.

No conflict of interest

D-0627

Achievement of therapeutic targets and use of cardioprotective medication in patients with type 2 diabetes mellitus: EuroAspire III Romania follow-up

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Aims: *EuroAspire III Romania Primary Care* investigated the achievement of therapeutic targets and the use of cardioprotective medication in accordance to the European guidelines of cardiovascular disease prevention in clinical practice 2007, in high-risk asymptomatic patients taken care of by their general practitioner (GP). *EuroAspire III Romania Follow-Up* evaluated the evolution of these parameters over a 1 year period. The aim of this work was to analyze the time trend of achievement of therapeutic targets and use of cardioprotective drugs in type 2 diabetes mellitus (T2DM) patients from the trial.
Methods: The study group comprised 43 patients with T2DM, 14 men (32.5%) and 29 women (67.5%), mean age±SD=59±8.6 years. The patients were submitted to clinical and biological evaluation at baseline and after 6 and 12 months. The main characteristics recorded were values of total cholesterol (TC), LDL cholesterol (LDLc), triglycerides (TG), fasting glycemia and glycated hemoglobin (HbA_1c) and use of cardioprotective medication (aspirin, statins and ACE inhibitors). GPs were advised to reinforce lifestyle changes and to optimize drug therapy in order to reach the targets mentioned in the guideline. The statistical methods used were chi-square test for trend and and Fisher's exact test. A value of $p < 0.05$ was considered statistical significant.
Results: The main results are shown in the table.
Table. Achievement of therapeutic targets and use of cardioprotective drugs in T2DM patients

Parameter	Number (%) of patients in target or receiving cardioprotective drugs			p
	Baseline	6 months	12 months	
TC <175 mg/dl	5 (11.6)	16 (37.2)	17 (39.5)	0.0045
LDLc <100 mg/dl	4 (9.3)	19 (44.1)	24 (55.8)	<0.0001
TG <150 mg/dl	19 (44.1)	22 (51.1)	20 (46.5)	0.82
Fasting glycemia <110 mg/dl	12 (27.9)	13 (30.2)	14 (32.5)	0.63
HbA_{1c} <6.5%	11 (25.5)	no data	23 (53.4)	0.0147
Aspirin	13 (30.2)	17 (39.5)	20 (46.5)	0.12
Statins	24 (55.8)	26 (60.4)	42 (97.6)	<0.0001
ACE inhibitors	21 (48.8)	26 (60.4)	29 (67.4)	0.0795

For all the parameters, the achievement of therapeutic targets and use of cardioprotective medication increased gradually in time. Statistical significant differences were recorded for TC (c^2=8.05, p=0.0045), LDLc (c^2=20.08, p <0.0001), HbA_{1c} (p=0.0147) and statin use (c^2=18.41, p <0.0001).

Conclusion: Preventive intervention, conducted by GPs, improved the lipid profile and glycemic control in T2DM patients, even though the guideline targets are far from being achieved. It also led to an important increase in the use of statins, but not of aspirin and ACE inhibitors. There is a strong need to continuously encourage GPs to apply current guidelines recommendations in T2DM patients.

No conflict of interest

D-0628

Quality of care at a diabetes clinic in a predominantly rural population at General Hospital, Kandy, Sri Lanka

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Objective: To determine the proportion of diabetic patients reaching target levels for blood glucose, blood pressure, serum lipids and body mass index and assess the quality and level of care of the study population.
Design: Cross sectional descriptive study.
Setting: Diabetes clinic, General Hospital, Kandy.
Patients: 685 diabetic patients attending diabetes clinic from September to December in 2007.
Measurements: Height, weight, Lipid levels, blood pressure, compliance with national guidelines regarding risk factor reduction, monitoring glycaemic control and screening for complications were recorded. Data collected by an interviewer administered structured questionnaire.
Results: Mean FBS & PPBS in the clinic population was 7.29mmol/l (± 2.65) [(131.4mg/dl (±47.8)] & 9.32mmol/l(±3.92) [167.9 mg/dl (± 70.7)]. Only 97(14.2%) patients had their HbA1c measured. Lipids were assessed in 376 (54.9%) patients. 114 (38.5%) received statin therapy, although 296 (78.7%) were above the target LDL. 58 (15.4%) patients achieved target LDL. 356(52%) patients received aspirin despite 641(93.6%) patients being over 40 years of age. 254(37.1%) patients were screened for retinopathy and 144(21%) had their feet examined. 299 (43.6%) patients reached target blood pressure. Mean systolic BP was 136 mmHg (SD=19). Mean Diastolic BP was 82 mmHg (SD=9).
538 (78.5%) patients reached AACE target level of BMI =27.
Conclusions: Non-availability of standard HbA1c measurement was a major deficiency in the assessment of glycaemic control. Screening for retinopathy, neuropathy & diabetic foot were sub-optimal. Management of lipids was unsatisfactory.
The AACE, BMI criteria of 27 was considered too high for ethnic Sri Lankans.
The difficulty in meeting targets showed that quality and level of care in the diabetes clinic was sub optimal. Excessive patient congestion at government diabetes clinics providing free service for all, is likely a major obstacle in the delivery of good quality services.

No conflict of interest

D-0629

Compliance with clinical practice guidelines for type 2 diabetes in an urban area of Pondicherry: treatment gaps and opportunities for improvement

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Introduction: The number of people developing diabetes is very high in the union territory of Pondicherry (5.04%).
Aim of the study: This study aims to find out prevalence of risk factors and treatment gaps among type 2 diabetics and explore opportunities for improvement in Diabetes Care.
Methods: Community based study was carried out using a cross-sectional study design among 99 of 684 diabetics chosen randomly from the field practice area of urban health centre, Muthialpet, Pondicherry. Data were collected from laboratory test results(for previous 1 year)available with the patients, an interviewer-administered questionnaire and Standardized physical assessments(weight, height, and blood pressure)carried out during the study period between Feb and March 2009. Data was analyzed using means and proportions in SPSS software.
Results: Ninety nine patients(50 men, 49 women, mean age 58.91± 11.83 yrs)with type 2 diabetes were enrolled in the study.The patients had diabetes for a mean of 12 years.At the time of the interviews,9.1%,43.43%, 27.27% of the patients were smokers,overweight and physically inactive respectively.Clinical indicators were,on average, at or near the recommended clinical practice guideline targets;48.8%,39.39%,and 0% of patients were at target levels for glycemic,blood pressure,and lipid control,respectively. Patients were receiving oral antidiabetic agents (81.81% of patients), insulin alone (3.3%), antihypertensive agents (36.36%), and lipid-lowering agents (4.4%). Patients were receiving a variety of antihypertensive therapies,alone or in combination, most commonly calcium channel blockers (55.55%), beta-blockers (30.5%),angiotensin-converting enzyme inhibitors (8.3% of patients), and thiazides(2.7%).Statins were the most commonly prescribed lipid-lowering agents (100% i.e. 4 of these patients).Only 4(4.4%) of the 99 patients were taking aspirin.Important therapy gaps were observed in the pharmacologic management in all three clinical target areas for hyperglycemia, hypertension, and dyslipidemia.Of 48 patients who were not at the ADA practice guideline target for glycemic control (FBSL < 126 g%), 6.1% were receiving no therapy. Also, 6.6% of patients whose blood pressures were above the target level were not receiving any antihypertensive drugs.Of note, 90.9% of patients whose LDL levels were greater than 100 mg/dl were receiving no lipid-lowering therapy.
Conclusion: There is sufficient scope for improvement,in terms of achieving various clinical targets.

No conflict of interest

D-0630

Clinical characteristics according to a family history in type 2 diabetes patients

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Background and aims: Type 2 diabetes mellitus (T2DM) has a strong genetic component, and the prevalence is notably increased in their family members. However, there were few studies about a family history of T2DM. We carried out this study to assess influences of the family history on clinical characteristics in T2DM patients.
Methods: This is a cross-sectional study involving 660 T2DM patients from 2 university hospitals. History and physical examination were done and fasting blood and urine samples were taken. If any first degree relative was diabetic, a family history of diabetes was considered to be present. Metabolic syndrome was defined by IDF criteria.
Results: 31.2 percent of total subjects have a family history of diabetes. Patients with a family history had a younger age (55.4±14.4 vs 59.7±14.3 year-old, $p<0.01$), higher weight (65.5±13.4 vs 62.7±11.8 kg, $p<0.05$) and BMI (25.0±3.8 vs 24.2±4.1 kg/m^2, $p<0.05$), higher waist circumference (89.9±12.0 vs 87.7±11.7 cm, $p<0.05$), longer diabetes duration (10.4±8.6 vs 8.6±8.4 years, $p<0.05$), younger age at diagnosis (45.3±12.2 vs 51.3±14.7 year-old, $p<0.01$) and higher triglyceride (195.8±151.5 vs 176.8±162.9 mg/dL, $p<0.05$) than those without a family history. Metabolic syndrome was more prevalent in familial T2DM with a statistical significance (54.5 vs 44.3%, $p=0.03$). Sex, blood pressures, HbA1c, C-peptide, creatinine, microalbuminuria, total cholesterol, HDL and LDL cholesterols were not different between familial and non-familial T2DM. On multiple linear regressions, the T2DM family history remained significantly associated with body weight, waist circumference and triglyceride.
Conclusion: In T2DM patients with a family history, the disease developed earlier. Metabolic risk factors and metabolic syndrome are prevalent in familial T2DM more than non-familial T2DM. This result raises the necessities of earlier screening for diabetes in family members of T2DM and more active prevention against cardiovascular disease in T2DM patients with a family history.

No conflict of interest

Nutrition and its effects on metabolism

D-0631

Serum undercarboxylated osteocalcin (ucOC) levels in diabetic patients

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Backgrounds and aims: Serum undercarboxylated osteocalcin(uc OC) is a bone-metabolism-related protein which reflects Vitamin K metabolism and increases in serum when synthesis of osteocalcin decreases by lack of Vitamin K. It is often reported that serum uc OC levels are increased in aged patients with Type 2 diabetes mellitus, but there are a few reports in younger diabetic patients. The aims are to study uc OC levels in the diabetic patients over a very wide age group in relation to diabetic control markers.
Subjects and methods: We examined serum uc OC, fasting blood glucose, glycohemoglobin, and glycoalbumin levels including renal function tests and other tests in the 554 diabetic patients (age: 27-93 years old; sex:330 men, 224 women). Serum uc OC was measured by ECLIA(Electro-chemiluminescence) method.
Results: The mean age of the subjects was 65.28±12.12 years old, mean HbA1c values were 7.04 ±1.11%, mean serum uc OC levels were 3.45±4.46ng/ml. When the value of serum uc OC exceeds 4.5 ng/ml, it defines as abnormal. In 554 patients, 91 patients(16.4%) were abnormal (41 patients of them were men (12.4%) and 50 patients women(22.3%), range of age was 30-89 years old). Women tend to have higher levels of serum uc OC than men. In the group under 50 years old, 8.6% patients showed abnormal high levels of uc OC. The mean age of the patients with higher uc OC values was higher than that of the patients with normal uc OC values. When we examined the relationship between serum uc OC levels and diabetic control marker. The mean HbA1c levels were 7.09±1.13% in the normal uc OC group and 6.77±0.92% in the higher uc OC group(p <0.005). There were 28 subjects who have renal dysfunction (Cre of more than 1.5mg/dl). 19 subjects of them were in higher uc OC group.The mean creatinin levels were 0.76±0.23mg/dl in the normal uc OC group and 1.48±1.74mg/dl in the higher group (p <0.0005).
Conclusion: This study shows that the frequency with the higher levels of serum uc OC is 16.8% in the patients with Type 2 diabetes mellitus. In relation to age, serum uc OC levels tend to be higher in older, female group than in younger group. It is suggested that serum uc OC levels reflect a decrease of bone mineral density with advancing age. However, the higher levels of uc OC were shown in young patients with slight glucose intolerance and renal impairment too. This may show that strict dieting in the diabetic patients contributes to deficiency of vitamin K intake.

No conflict of interest

D-0632

Effects of spirulina platensis on insulin resistance in HIV-infected patients

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Background: HIV-infected patients develop a group of metabolic abnormalities due to the action of the virus and/or to antiretroviral (ARV) drugs. There is a need for molecules that would be safe to use with ARV against these metabolic abnormalities. Spirulina, a widely used food supplement, improves the lipid profile and glycemic control in people with diabetes, suggesting that it could have some effects on insulin sensitivity (IS).
Method: We carried out a randomized double blind placebo controlled trial for 8 weeks at the National Obesity Centre of Cameroon to explore the effects of *Spirulina platensis* on HIV/HAART-associated insulin resistance and dyslipidemia. Soya bean was used as placebo to control for renutrition effect. We evaluated IS in 143 HIV-infected patients using the short insulin tolerance test(SITT) and found 44 with insulin resistance(IR), so eligible for the trial. 3 did not meet inclusion criteria while 8 refused to participate. 17 were randomized to spirulina and 15 to placebo. Each subject received an average of 18.6g of spirulina or placebo powder daily and were seen every 2weeks. 2subjects were discontinued treatment in the spirulina group due to acute intercurrent infection and 4 losses to follow up were registered in the spirulina group giving a follow-up rate of 82%. For each subject we collected clinical/anthropometric data, measured IS and fasting glucose and lipids at baseline and 8weeks from baseline. Physical activity and diet did not change over the study duration. Data was analyzed as per protocol.
Results: At baseline for the trial, treatment groups were comparable for insulin sensitivity (1.59±0.04 vs 1.58±0.04 %/minute), age(36±11 vs 39±7 years),sex distribution, HAART duration(22±14 vs 27±17months), BMI(23.8±3.2 vs 24.7±2.8kg/m^2),fat-free mass(38.2±11.5 vs 37.1±10.9Kg), total cholesterol(1.66±0.49 vs 1.79±0.43g/l), and triglycerides(0.72±0.53 vs 0.68±0.28g/l). After 8weeks, 100% (11) of HIV-infected subjects on spirulina versus 69% of the placebo group improved their IS (p=0.049). The rate of blood glucose decrement during SITT, reflecting IS was significantly greater in the spirulina group (-2.63 vs -1.68 g/l/minute, p=0.005). No significant difference in changes in BMI, FFM, TC, and TG was observed. On spirulina, there was a 1.45 increase in the chance of improving on IS compared to placebo (1.05<rr<2.02).
Conclusion: This preliminary study suggests that spirulina could be used in association with other approved methods to intensify the prevention of insulin resistance and dyslipidemia in HIV-infected patients, but appeal for validation in larger sample over a longer duration.

No conflict of interest

D-0633

Emotional eating and risk of overweight among teenage girls.

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Aim: To determine differences in behavioural eating habits of overweight and normal adolescent girls; to differentiate between various habits such as emotional eating, self-control, food habits, and general health, and assess how these factors contribute to overweight risk.
Methods: A 15-year follow-up of mother-daughter pairs representing pregnancies affected and unaffected by glucose intolerance (GDM and IGT) resulting in singleton live births between 1989-1991 at the Royal Victoria Hospital in Montreal. As daughters of GDM cases were at greater risk of overweight than daughters of controls, the abstract explores the behavioural correlates of being overweight (BMI >85%ile) among teens. Chi-square test for differences in weight categories was evaluated by eating behaviour categories.
Results: Mean age of girls was 15.3 (±0.7) years, mean BMI percentile was 65.6 (±26.4), and mean waist circumference was 78.1 (±11.0) cm. Overall, 29.6% of teens had a BMI ≥85%ile. Overall, among those who regularly ate without feeling hungry, 58.3% were overweight compared to 21.9% overweight among those who ate when hungry (p=0.03). For those who experienced feelings of guilt and self-hatred after overeating, 75% were overweight, while 21.4% were overweight among those with guilt-free eating (p=0.00). Among those reporting minimal control on fighting urges to stop eating, 48% were overweight, while 25% were overweight among those that were able to cease eating when satiated (p=0.06). Among those who snacked regularly and often skipped meals, 35.3% were overweight, while 27% were overweight among those who consumed three meals and only occasionally snacked (p=0.27). Among those who were overwhelmed by thoughts of eating, 48.7% were overweight, while 22.6% were overweight among those who gave little thought to unwanted eating urges (p=0.009). Only 3 girls

reported vomiting to prevent weight gain, therefore, it was not an important determinant of BMI.

Discussion/conclusion: Girls who reported eating when not hungry and having less control over eating were more likely to be overweight than those having control over eating urges. The results are important for formulating public health messages aimed at reducing the epidemic in overweight and obesity among youth. Erratic eating behavioural habits have also been identified as risk factors for adult overweight and obesity.

No conflict of interest

D-0634

Dietary conjugated linoleic acid isomers (cis-9, trans-11 and trans-10, cis-12) modulate insulin-dependent and independent skeletal muscle glucose transport in vitro

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Impairments in the skeletal muscle insulin signaling cascades, glucose transport and GLUT4 translocation are the critical defects in insulin resistance and type 2 diabetes (T2D). Research into the molecules that could preserve, protect, repair or regenerate skeletal muscle glucose metabolism would be a major advance in the treatment and management of T2D. Conjugated linoleic acid (CLA) refers to a group of positional and geometric isomers of conjugated dienoic octadecadienoate (C18:2) that are abundant in dairy products, as well as ruminant and other meat products. CLA has been reported to have beneficial effects in both experimental animal models and in humans. However the activity of CLA has been questioned by some investigators. Although some studies indicate that CLA stimulates muscle glucose uptake in animal models, no study has yet elucidated the molecular pharmacological properties of CLA isomers on skeletal muscle. The current study investigated the effects of CLA isomers on skeletal muscle glucose transport with rat L6 skeletal muscle cells. Briefly, fully differentiated L6 myotubes were treated with or without CLA isomers (cis-9, trans-11and trans-10, cis-12; either alone or as a 50:50 mixture) in the presence or absence of insulin. Glucose uptake was evaluated using either isotope- or fluorescence-labeled 2-deoxyglucose. The results indicated that CLA isomers stimulated glucose uptake in the absence of insulin. Of these treatments, the CLA isomer mixture showed a significantly elevated glucose uptake compared to the individual isomers. Interestingly, insulin potentiated the stimulatory effect of c9, t11 CLA isomer on glucose uptake, inhibited the effect of the CLA mixture and had no effect on the actions of the c10, t12 CLA isomer. The additive effects of c9, t11 CLA isomer and insulin indicate that this isomer may stimulate a parallel glucose uptake pathway. In contrast, the fact that the combined actions of c10, t12 CLA isomer and insulin were not additive may be interpreted as showing that this isomer and insulin utilize the same pathways (at least terminally). In addition, the glucose uptake inhibitory effect of the CLA isomer mixture when combined with insulin may be due to the saturated activation of glucose transport by multiple pathways, thus leading to desensitization of insulin signaling. In summary, the present study for the first time demonstrates that CLA isomers have stimulatory effects on both insulin-dependent and independent skeletal muscle glucose transport *in vitro*. However further studies are required to understand the diverse, isomer specific mechanistic pathways of CLA on skeletal muscle glucose metabolism.

No conflict of interest

D-0635

Multiminerals-enriched yeast alleviates oxidative stress, metabolic disorders and immune function impairment in streptozocin-induced diabetic mice

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Aims: Chromium, selenium and zinc malnutrition has been implicated in the pathogenesis of diabetes mellitus. However, supplementation with these trace elements is always accompanied by side effects because of their potential toxic properties. Minerals-enriched yeast is considered to be an ideal novel form with higher bioavailability and lower toxicity for minerals supplementation, whereas evidence regarding its beneficial effects in diabetes mellitus is rare. The aim of this study was to investigate the effects of Multiminerals-enriched yeast (MMEY), which contained elevated levels of chromium, selenium and zinc together, on oxidative stress, lipid metabolism and cytokines expression in a diabetic animal model.

Methods: Streptozocin (STZ, 150 mg/kg b.w., i.p.) induced diabetic male Balb/c mice (n=80) were randomly divided into diabetes control group and three treatment groups, which were administrated by oral gavage with low, medium or high doses (1.6 g/kg b.w., 3.2 g/kg b.w. or 4.8 g/kg b.w.) of MMEY, respectively. At the same time, healthy adult male Balb/c mice (n=40) of the same body weight were randomly assigned into vehicle control group and high dose of MMEY control group. After 8 weeks duration of treatment, the animals were anesthetized and then sacrificed. Serum glucose, triglyceride (TG), total cholesterol (TC), low-density lipoprotein cholesterol (LDL-C), high-density lipoprotein cholesterol (HDL-C), superoxide dismutase (SOD), glutathione peroxidase (GPX), glutathione (GSH) and malondialdehyde (MDA) levels were determined. Liver and pancreatic islet tissues in each group were preserved for histopathological examination. Cytokines interleukin-2 (IL-2) and interleukin-2 (IL-4) expression in spleen lymphocytes were measured using flow cytometry.

Results: No adverse effects were observed in the high dose of MMEY control group. Treatment of diabetic mice with medium or high dose of MMEY supplementation significantly decreased serum glucose, TG, TC and LDL-C levels whereas it increased serum HDL-C level. Those two groups also showed a significant elevation in the serum SOD, GPX and GSH concentration, and a reduction in serum MDA concentration in STZ-induced diabetic mice. In addition, MMEY supplementation ameliorated beta-cell pathological damage in pancreatic islet, elevated the decreased thymus or spleen-body weight ratio and increased IL-2 and IL-4 expression in spleen lymphocytes.

Conclusions: Our results indicate that MMEY may have capacity for inhibiting hyperglycemia, abating oxidative stress, modulating lipid metabolic disorder and immune function impairment in diabetic mice, which suggests MMEY as a candidate for future studies in the prevention and treatment of diabetes mellitus. Further study for the detailed mechanism is needed.

No conflict of interest

D-0636

The effects of the omega-3 polyunsaturated fatty acids supplements in the prevention of cardio-metabolic parameters in metabolic syndrome patients

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Aims: To test the functional effects of a diet containing omega-3 PUFA supplements vs. baseline diet recommended to patients with metabolic syndrome.

Methods: A total of 110 patients with metabolic syndrome (MS) according to IDF criteria, aged 58±6.7 years, were allocated to 2 groups, matched by sex and age: group A (56 patients) – diet according to ESC recommendations and individual needs; group B (54 patients) – the same diet + capsules of fish oil (1,0 g eicosapentanoic acid, 1,0 g docosahexanoic acid and 0,1 g a-tocopherol acetate). Body fat mass (BFM) and body fat percent (%BF) were measured by bioimpedance analysis (BIA) using InBody 3.0 Analyzer. Fasting plasma glucose, HbA1c, total cholesterol, LDL cholesterol, HDL cholesterol, triglycerides, plasma insulin, adiponectin and leptin were measured according to standard procedures. Insulin resistance was measured using HOMA-IR index. Oxidative stress was assessed using FormOx systems monitor on a blood drop. The duration of the study was 6 months.

Results: Baseline characteristics were similar between groups. After 6 months, omega-3 supplements determined a significant improvement of metabolic parameters: total cholesterol - 195 ± 18.4 mg/dl vs. 214 ± 20.5 mg/dl ($p<0.002$); HDL-cholesterol - 56 ± 12 mg/dl vs. 47 ± 15 mg/dl ($p<0.05$); triglycerides - 138 ± 53 mg/dl vs. 149 ± 69 mg/dl ($p=0.002$); fasting plasma glucose - 111 ± 12 mg/dl vs. 118 ± 19 ($p<0.0001$); HOMA-IR - 4.55 ± 2.3 vs. 4.64 ± 3.3 ($p=0.016$). Also, patients in group B experienced a significant decrease of oxidative stress (264 ± 78 Fort units vs. 320 ± 92 Fort units – $p<0.0001$) and a statistically significant increase in adiponectin levels (from 9.46 ± 2.76 to 10.86 ± 2.68). Mean BMI, mean %BF, mean BFM and mean waist-to-hip ratio (WHR) were significantly lower in group B vs. group A (BMI-31.12 kg/m^2 vs 29.1; %BF - 30.48 vs 27.48; BFM - 29.42 kg vs 26.78; WHR - 1.07 vs 1.02). BMI was statistically correlated with BFM ($p<0.0001$) and

%BF (p<0.0001). %BF (p<0.001) was correlated with WHR (p=0.016), leptin values (p<0.001), adiponectin values (p<0.05) and leptin/adiponectin ratio (p<0.001).

Conclusions: Omega-3 PUFA enriched diets bring metabolic parameters closer to target values, thus lowering cardiovascular risk of MS patients. Also, oxidative stress is decreased, underlying the role of omega-3 in the delay of endothelial cells damage.

No conflict of interest

D-0637

Effect of oral administration of thiamine on serum markers of inflammation in type 2 diabetes patients

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Aim: To evaluate the effect of oral administration of thiamine on serum markers of inflammation in type 2 diabetes patients.

Patients and methods: A randomized, double-blind, placebo-controlled clinical trial was carried out in 24 type 2 diabetes patients, aged between 30 to 60 years, BMI between 25.0 to 34.9 Kg/m^2, fasting glucose <205 mg/dl, A1C <8%, without pharmacological treatment. At beginning and at end of the study, BMI, waist circumference, a metabolic profile (fasting glucose, postprandial glucose, A1C and lipids), C-reactive protein, leptin, adiponectin, IL-6, TNFa concentrations were measured. The patients were randomly assigned to receive thiamine (150 mg/day), or placebo for a period of 30 days.

Results: In both groups decreased the BMI (29.4 ± 3.0 vs. 29.0 ± 3.2 kg/m^2, p = 0.028; and 29.7 ± 3.1 vs. 29.1 ± 2.7 kg/m^2, p = 0.016); and leptin (32.9 ± 13.3 vs. 26.9 ± 12.9 ng/ml, p = 0.023 and 32.9 ± 13.3 vs. 26.9 ± 12.9 ng/ml, p = 0.023); respectively thiamine and placebo groups. Thiamine administration decreased fasting glucose (123 ± 19 vs. 109 ± 16 mg/dl, p=0.013), postprandial glucose (197 ± 60 vs. 145 ± 38mg/dL, p = 0.047). Not showed modification in A1C (6.4 ± 0.4 vs. 6.4 ± 0.8%, p = 0.285), C-reactive protein (5.8 ± 2.9 vs. 5.0 ± 2.3, p = 0.128), adiponectin (73.2 ± 41.3 vs. 62.1 ± 31.9, p = 0.182), IL-6 (4.8 ± 1.0 vs. 4.4 ± 1.7, p = 0.423), and TNFa concentrations (14.4 ± 6.2 vs. 13.2 ± 9.1, p = 0.593).

Conclusion: One month administration of thiamine improves fasting glucose and postprandial glucose without modification in markers of inflammation.

No conflict of interest

D-0638

Inulin increases postprandial serum short-chain fatty acids and reduces free fatty acids and ghrelin in healthy subjects: possible mechanisms by which dietary fibre reduces risk for type 2 diabetes.

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Diets high in dietary fibre have been associated with reduced risk for type 2 diabetes. This may be due, at least in part, to the ability of the short chain fatty acids (SCFA) produced during the colonic fermentation of fibre to influence circulating concentrations of free fatty acids (FFA) and gut hormones involved in insulin secretion and body weight regulation. Inulin, a prebiotic and fermentable soluble fibre, is being added to, or replacing, available carbohydrate in many new food products based on its perceived health benefit. We aimed to determine the acute effects of inulin on postprandial glucose, insulin, c-peptide, SCFA, and gut hormone responses (GLP-1, GIP and ghrelin) in normal subjects. Twelve overnight fasted, healthy subjects were studied for 6 hours after consuming 400mL drinks containing either 80g high fructose corn syrup (80HFCS), 56g HFCS plus 24g inulin (inulin), or 56g HFCS (56HFCS) using a randomized, single-blind, cross-over design. A standard lunch was served 4 hours after the test drink. The treatments were designed to distinguish between the effects of adding inulin to HFCS (56HFCS vs. Inulin) or partially substituting inulin for HFCS (80HFCS vs. Inulin). The addition or substitution of inulin did not alter glucose and insulin responses. Serum acetate, propionate and butyrate were significantly higher after Inulin than both 56HFCS and 80HFCS beginning at 4 hours. FFAs fell at a similar rate following all test drinks but Inulin resulted in significantly lower serum FFA at 4 hours compared to 56HFCS. Plasma GLP-1 was higher 30 minutes after inulin than 56HFCS, while plasma ghrelin was significantly lower 4, 4.5 and 6 hours after Inulin than 56HFCS and 80HFCS. The results of the study support the hypothesis that SCFA generated from the colonic fermentation of dietary fibre can influence serum FFA and certain gut hormones involved in the regulation of body weight. Therefore, they may provide a link between dietary fibre intake and prevention of type 2 diabetes through a SCFA-mediated reduction in insulin resistance, a reduction in food intake and/or obesity. This work was supported by the Canadian Institutes of Health Research.

No conflict of interest

D-0639

Low-fat vegetarian diet improves oxidative stress markers in patients with type 2 diabetes

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Background and aims: In recent years attention is being paid to increased oxidative stress in diabetes. It has been shown that reactive oxygen species are able to induce insulin resistance in various tissues and in addition they increase the vascular risk. Clinical trials using vegetarian diets have shown greater improvements in blood glucose control and cardiovascular health than conventional hypocaloric diabetic diet. The aim of our study was to evaluate the effect of low-fat vegetarian diet compared to conventional diabetic diet with similar caloric restriction on plasma concentrations of oxidative stress markers in patients with type 2 diabetes after a 3-month-diet-intervention.

Materials and methods: Open, parallel randomized study. 70 patients with type 2 diabetes were randomly assigned to either experimental group (EG) following a low-fat vegetarian diet or the control group (CG) following conventional diabetic diet with similar caloric restriction (-500 kcal/day). We measured all common anthropometric and laboratory parameters including oxidative stress markers. All procedures were done at start (0) and after 12 weeks.

Results: Average weight loss was greater in the EG than in the CG (6.41±4.23 vs. 3.47±4.07 kg; p<0.01). Diabetes medication was reduced according to the study protocol in 15 subjects from the EG (42.86%) vs. in 2 subjects from the CG (6.45%). We observed a trend to a greater reduction of plasma HbA1c, cholesterol, free fatty acids and fasting glucose in the EG, but the differences were not statistically significant. There were significant differences in plasma concentrations of oxidative stress markers between the groups: Vitamin C increased significantly in the EG, whereas it decreased in the CG ($p \leq 0.01$), the same with superoxidedismutase (p<0.01); this trend is also evident in glutathionperoxidase and glutathion, but the differences did not reach statistical significance. Plasma concentrations of thiobarbituric acid reactive substances decreased in the EG but increased in the CG (p<0.01)

Conclusion: Our results indicate that low-fat vegetarian diet leads more effectively to reduction of diabetes medication and improvement of oxidative stress markers than the conventional diabetic diet and it could be a more convenient alternative in treatment of type 2 diabetes.

No conflict of interest

EDUCATION

Improving effectiveness of diabetes education

D-0640

A comparative study of knowledge, attitudes and practices of complications of type 2 diabetes and associated risk factors among patients with type 2 diabetes in Dar es Salaam, Tanzania and New Hampshire, USA

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Background: An analytical, cross-sectional study was done to compare the differences in Knowledge, Attitudes and Practices of complications of type-2 diabetes and associated risk factors, among patients with type 2 diabetes in Tanzania and USA.

Methods: Swahili and English structured questionnaires were administered to 86 diabetic patients attending clinics in 3 hospitals in Dar es Salaam, Tanzania and 77 patients attending at Dartmouth Hitchcock Medical Centre (DHMC) in New Hampshire, USA respectively. Study participants were selected by simple random sampling over a period of 6 weeks in each country. Data from both study areas were analyzed using SPSS data analysis tool.
Results: This study revealed no significant difference in proportion of patients knowledgeable of complications of diabetes and associated risk factors in the two communities with both communities 84.9% in Dar es Salaam and 92.2% in New Hampshire scoring high on knowledge, P = 0.15. There was also no significant difference in attitude towards diabetes whereby majority had a positive health promoting attitude towards the disease, i.e. only 9.3% in Dar es Salaam and 5.2% in New Hampshire considered regular physical exercise to have little influence on diabetes management, P = 0.29, and 5.8% in Dar es Salaam and 5.2% in New Hampshire considered weight management to have little influence on the management of their Diabetes, P = 0.86.
There were however significant differences in practice whereby; only 11% of study participants in Dar es Salaam compared to 93.9% in New Hampshire reported to be doing blood glucose check-ups at least once a week, P < 0.001; only 63% of study participants in Dar es Salaam compared to all in New Hampshire reported to weigh themselves at least once a month, P < 0.001; and 48% in Dar es Salaam compared to 69.4% in New Hampshire reported to be doing physical exercise at least 4 to 6 times a week for at least 15 minutes, P = 0.02.
Conclusions: In conclusion, although knowledge on Diabetes Mellitus was high in both settings, and attitude positive, significant differences in practice were noted with Dar es Salaam scoring poorer compared to New Hampshire.
More elaborate studies assessing multi-factorial of issues that influence positive health attitudes and behaviors towards Diabetes Mellitus should be conducted, especially in less developed countries. Furthermore efforts should be done to further expand the diabetes health education being provided at the health care facilities in Dar es Salaam so as to reach out to more diabetes patients in other health facilities in the country.

No conflict of interest

D-0641

Patients' perspectives on factors that influence diabetes care and treatment compliance: voices from Iran

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Aims: Although Diabetes mellitus is of high concern in Iran, and the level of control is unacceptable, few qualitative studies have been carried out to reflect experiences and perceptions of patients on the barriers and motivators to self-care.The aim of this study was to explore a culturally based experience of Iranian diabetic patients regarding the personal and environmental barriers to and facilitating factors for diabetes self-care.
Methods: Six focus groups were conducted among type 2 diabetic patients in the Charity Foundation for the Special Disease's diabetes clinic, which is a large team-focused clinic. Purposeful sampling was used. People with confirmed type 2 diabetes were included. Newly diagnosed patients (less than six months) and all type 1 diabetic patients were excluded. Because of cultural issues we had 3 focus groups for each sex in order to encourage free and honest expression. Participants included 22 women and 21 men(n=43). Framework analysis was used to extract the themes from the data.
Results: The data showed five main barriers: physical barriers (physical effects of diabetes, long-term health conditions, physical effects of treatment, and no symptom cues); psychological barriers (health beliefs, cognitive barriers, perceptions of time required, negative perceptions of Iranian medicine, and stigma); educational barriers (lack of knowledge about diabetes, health services life-style requirements, and alternative therapies); social barriers (group pressure and lack of family support, lack of public awareness of diabetes, unsupportive macro-environment, and various difficultiesin the social system, (such as high inflation rate), lack of appropriate programs in media, and lack of standard resources to educate people); and care system barriers (service availability, acceptability, and accessibility). Along with the barriers, there were some motivators that the participants mentioned as a stimuli to control their diabetes. They included beliefs about diabetes, perceived responsibility for family, religious beliefs, and the views of significant others.
Conclusion: Public health education and culturally based interventions are needed to improve diabetes management in Iran. In addition to personal factors, diabetes health educators should pay attention to the environmental factors when they develop programs.

No conflict of interest

D-0642

Myths and misconception about diabetes mellitus: Bangladesh perspective

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Aims: To determine the level of myths and misconception regarding DM in the health professional (HP) and non-health professional (NHP) in Bangladeshi populations.
Methods: Cross sectional study was conducted between January-April, 2008. Recruitment of subjects to the study populations was by convenience sampling. A pre-set self-administered questionnaire was distributed across urban and suburban communities, and all levels care services. Data was analyzed using SPSS.
Results: Three thousand and fifty eight HP and NHP respondents returned a completed questionnaire. Of them, 20.5% were general physicians, 3.0% diabetic practitioners, 10.5% general nurses, 8.3% nurses with diabetes training, 2.0% nutritionists, 55.7% general population (service holder, businessman, teacher and students). Female, illiterate and low socioeconomic class had more misconceptions about the diabetes. (p<0.0001). Forty nine percent reported that diabetics should eat special diabetic diets and they have restriction on diet also, 33.5% subjects reported that sour and bitter food act like insulin and tablet, 31.6% believes that there is no restriction for the diabetes patients to use corn plaster for the treatment of corn of leg, 27.7% had misconception on those who have diabetes but no complication need not go to doctor so frequently. The general physician and nurse reported myths more as compared to physicians and nurse who have trained on diabetes management (p<0.0001).
Conclusion: Education is an important factor that might have reversed misconception. So efforts should be made to promote health education and awareness special emphasis

No conflict of interest

D-0643

Social support, treatment adherence and metabolic control of type 2 diabetes mellitus patients: a perspective for care

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Introduction: Social support has been related with a person's good adaptation to a chronic disease and is highlighted among the factors favoring treatment adherence and the development of perceived self-efficacy.
Method: cross-sectional study with a quantitative approach. The aim was to analyze the relation between perceived social support, adherence to self-care activities, adherence to medication treatment, metabolic and clinical control of 162 type 2 Diabetes Mellitus patients, without severe complications, under outpatient follow-up, between May and November 2008, after approval by the Research Ethics Committee. For data collection, the Social Support Network Inventory, the Diabetes Self-care Activities Questionnaire and the Treatment Adherence Measure were used.
Results: 58% of participants were women, with an average age of 59 years (SE=8) and mean education 5.4 (SE=3.9) years; 41.4% were retired or

pensioners; mean diagnosis time was 15 (SE=14.8) years; 54.3% were obese and 35.8% overweight; 64.2% were under combined insulin and oral anti-diabetic treatment; mean systolic blood pressure was 140 mmHg (SE=22) and diastolic 78mmHg (SE=12); mean glycated hemoglobin was 9.1% (SE=1.8); total cholesterol 182 mg/dl (SE=47.7); HDL 42 mg/dl(SE=9.3), triglycerides 215 mg/dl (SE=237.3) and creatinine 1.1% (SE=0.5). High perceived social support was observed and the main source were relatives, followed by health professionals. Adherence to self-care was low in 69.1% of the participants and high for medication treatment (95.7%). At p=0.05, social support was directly correlated with age (0.2), self-care adherence (0.2) and medication adherence (0.2); and inversely related with education level (-0.24). Adherence to self-care was directly correlated with medication adherence (0.2), and inversely with education level (-0.2); medication adherence was directly correlated with self-care adherence (0.2), with daily insulin application (0.2), with daily oral anti-diabetic agent intake (0.3) and inversely related with diastolic pressure (-0.15).
Conclusions: Data suggest that education level is a variable that should be considered in diabetes mellitus education and can be a barrier for self-care, while social support can be a facilitator to obtain adherence to treatment and self-care. Other methodological approaches should be used to broaden studies on the relation between these variables.

No conflict of interest

D-0644

Diabetes knowledge among the general public in Brunei

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Introduction: World wide the number of people with diabetes is in continuing rise and nowadays we are seeing type 2 diabetes at increasingly younger age this most likely due to the change in the eating habits and physical activity. With the accumulation of the national wealth, diabetes stands to be one of the most important health problems in Brunei.
The aim of this study is to explore the general public knowledge about diabetes, that is to identify the needs for future awareness programs.
Methods: B5 Diabetes knowledge Questionnaire (Southeast Chicago Diabetes Community Action Coalition) was used in this study. It is 23 item questionnaire to test the individual's understanding of prevention and management of diabetes and its complications (scores 0-23).
The investigators went around the main fast food restaurants in the city Kuala Belait and asked the customers to answer the questionnaire while they were waiting for their meals
Data was coded and entered into Excel and subsequently analyzed in SPSS.
Results: 1065 persons answered the questionnaire. 57% of them were females. There ethnic origin was; Malay 59%, Chinese 22%, Indigenous 11%, Others 8%. Their age distribution; 25% < 18, 52% 18-44, 21% 45-64 & 2% ≥ 65 y. Their level of education; primary 10%, secondary 70% & higher education 20%. Diabetes was present in 7% of the subjects and in the families of 30% of them.
Their mean diabetes knowledge score was low (8±5.3).
Better knowledge about diabetes was found in the subjects with previous diagnosis of diabetes in them or in their families, and those who believe for some other reason that they are at high risk of diabetes ; mean±SD: 11.3±6.0, 9.8±4.9, 8.6+5.3 compared to the subject who are not diabetic and believe they are not at diabetes risk; mean 7.4±4.3 (P <0.0001).
There was a positive correlation of the diabetes knowledge with the level of education; university 9.8±5.9 vs. secondary 7.8±5.0 vs. primary 5.7±3.8 (P < 0.0001).
The 45-64 age group scored the best (10.6±5.5) followed by the age group 18-44 (8.8±4.7) and the worst was those under 18 (5.9±3.1) and those aged 65 and above (5.9±2). P <0.0001.
Females and Males appeared to have same knowledge level 8.6±5.3 vs. 8.0±5.0 (P 0.219). The ethnic origin was not found to be a predictor of diabetes knowledge; the score for Malay, Chinese, Indigenous and other groups was 8.0±4.7, 8.5±4.8, 9.4±5.0, 8.9±5.0 respectively.
Discussion: Diabetes knowledge is poor amongst the general public.
The diabetes education should not only be offered to people with diabetes and healthcare professionals but also mandatory.
That everybody in the society get proper understanding of diabetes and be empowered to adopt healthy lifestyle to prevent diabetes and its consequences.

No conflict of interest

D-0645

Insulin dosage blunders due to mismathch between vial strength and syringe specifications are common; the need for intensive patient education

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In India U\40 and U\100 insulin vials are available. Syringes are available in two types, U\40 and U\100, to suit specific insulin vial. Occasionally, either due to lack of training or because of carelessness of the patient, mistakes in insulin injection procedure leading to hypoglycaemia or hyperglycaemia which can sometimes be life threatening, are created. Some of the mistakes the author has come across are described below.

1. A 34 year old patient was on premixed insulin, [U\40], 40 units twice a day and his blood glucose was poorly controlled, thus he was advised 50 units twice a day. Since capacity of U\40 syringe is only 40 units, he was advised to use U\100 Syringe so that "you can take up to 50 units mark". Thus he actually took 20 units twice a day.
2. A 34 year old male on premixed insulin, 48 units before breakfast and 34 units before dinner was investigated for poor control. From the cost of vial we derived that he was taking U\40 insulin. When asked, "How long the bottle lasts?", we found that it was lasting two and half times the expected period. Thus he was taking U\40 Insulin with U\100 syringe [40% of the prescribed dose].
3. A 45 year old female patient was put on premixed insulin, 8 units before breakfast and dinner. She approached a trainee nurse in her village and forced her to administer insulin. Under pressure, the nurse injected entire vial containing 400 units through 10 ml multi purpose syringe. Patient walked 1.5 km to reach home and subsequently developed hypoglycemia. She was shifted to a nursing home immediately and observed for 48 hours under constant intravenous glucose infusion and dire emergency was avoided.
4. A 56 year old patient was prescribed 10 units of premixed insulin,[U\40] before dinner. She was doing well with appropriate syringes and vials purchased from the market, till she received a vial of premixed insulin [U\100], free of cost from her employer. For few days she used U\40 syringe to inject insulin from U\100 vials till the family doctor noticed that he was drawing U\100 insulin in U\40 syringe. He decided to draw up to 25 units mark to account for the difference.[He should have drawn up to 4 units mark] Thus he injected 62.5 units subcutaneously.
5. A 43 year old female patient was on premixed insulin, 20 units before breakfast and dinner. After some time she decided to do cost cutting by purchasing premixed insulin, U\40 vial from the market and by refilling empty cartridges via syringe filled with insulin drawn from U\40 vial. Soon her blood glucose rose significantly [the cartridge contains 100 units per ml, U\40 insulin from vial contains 40 units per ml.].

Conclusion: Insulin dosage blunders due to mismatch between vial strength and syringe specifications are common, thus the need for intensive patient, nurse and family physician education.

No conflict of interest

D-0646

Diabetes Education in India: From Concept to Operational Reality

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Background: With around 40.9 Million people living with Diabetes, India is the highest Case Burden country in the World. Approach to management is doctor centric, limited number of Endocrinologists and GP's are struggling to treat this huge patient cohort. Hence, there is urgent need to expand base of healthcare providers appropriately trained in Diabetes Education to empower patients with knowledge and skills to better manage their disease and improve treatment outcomes. Oposed to this compelling need, there is no formally recognized National Curriculum for Diabetes Education for allied health professionals in India. Few of the estimated 500,000 nurses, dieticians, etc. have any professional education in Diabetes.
Assessment: A multi disciplinary team comprising members from the International Diabetes Federation, Project HOPE, Duke University and Industry Partners identified a critical deficiency in qualified nurses, dieticians, etc. necessary to effectively empower patients living with diabetes. A method to

impart diabetes management knowledge and skills broadly and rapidly was devised and the first Pan India project on Diabetes Education was designed.

Program design/delivery: The Curriculum is based on the IDF DECS guidelines. Indian experts were engaged to ensure extensive cultural adaptation and referencing against existing Indian medical standards and practices. A 6-month distance learning program with reinforcement at regional training centers was selected to reach the greatest number of allied health care workers most cost effectively and with the greatest flexibility. Project HOPE is partnering with 7 centers of excellence across the country and has trained 16 of their best professionals as Master Trainers (MT) by experts from IDF and India. The MT's are training 9 batches in these centers with around 200 nurses, dieticians, etc. on the program. Scaling is underway and around 50 MT's from 12 Centers will be trained to ensure sustainability. Over the next 2 years these MT's will train over 3,000 allied health professionals. Evaluation will include clinical outcomes such as QOL, HbA1c and diabetes-related complications.

Challenges/solutions: Included finalizing the design and mode of implementation. Forming public-private partnerships was also critical to ensure greater regional expansion, higher quality services and greater acceptance. The challenge of uniformity of trainings and materials was addressed by utilizing a CD-ROM with standardized materials.

Conclusions: Project HOPE is creating an enabling environment for Diabetes Education in India by developing the first national curriculum and a program that offers standardized training across the country. The large cadre of healthcare professionals trained in Diabetes Education, will serve patient population improving treatment outcomes.

No conflict of interest

D-0647

Low adherence to educational program in women with a history of gestational diabetes

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Women with Gestational Diabetes Mellitus (GDM) show a high risk of developing diabetes; therefore, emphasis has been made on post-partum follow-up in applying educational and clinical strategies aimed at preventing and diagnosing early this condition in a relatively young population.

Objectives: To know the progression to diabetes of women with GDM enrolled in a post-partum follow-up program within a ten year period.

Methods: 139 women with previous GDM attending the Postpartum Follow-up Program at the Diabetes and Pregnancy Unit, University of Carabobo, "Dr. Enrique Tejera" Hospital, Valencia, Venezuela were assessed, from a total of 248 referred to the program from September 1998 to September 2008. Under the program, the women were screened for diabetes 2-4 months postpartum and then annually. They were also called to basic theoretical-practical educational activities, aimed at promoting lifestyle changes, once a week during the first month. Socio-demographic data, attendance at educational sessions and previous screening results were registered. 47 (34.53%) tested positive for diabetes during screenings. The remaining 92 were tested with a 75g - oral glucose tolerance test. Plasma glucose levels were measured by the enzymatic method with an automated analyzer (Cienvar Kit). The Graffar method for socio-economic stratification was used. Student's t, Fisher exact test and x^2 were used for variable association.

Results: The average age was 34.9 years $\pm$ 6.44 and 4.04 years $\pm$ 2.68, postpartum period. 41.01% completed high school and/or university studies and 93.73% was placed in socio-economic strata II, III, IV (I-V). 44.6% did not attend any of the basic educational program sessions and only 17.98% attended all the scheduled sessions. 5.75% were diagnosed with diabetes, 21.6% with impaired glucose tolerance and 7.9% with impaired fasting glucose. Progression to diabetes, which overall increased to 39.6%, was more frequent in women with higher post-partum periods ($p<0.002$) and lower socio-economic level ($p<0.03$).

Conclusions: More than half of the women with GDM history attended the scheduled diabetes screenings during postpartum but showed very low compliance to the educational sessions. The progression rate to diabetes and prediabetes is high, showing the need for further research on social determinants of poor adherence to preventive programs.

No conflict of interest

Genetics of diabetes

D-0648

-1123 G/C mutation of PTPN22 gene is associated with latent autoimmune diabetes in adults of Shanghai Han ethnics

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Objective: Protein tyrosine phosphatase non receptor 22 (PTPN22) gene locates in chromosome 1p13.3-13.1, which encodes a lymphoid protein tyrosine phosphatase (LYP). The recent study showed that the 1858T variation in PTPN22 was associated with T1DM. This study is to explore the relevance between the polymorphism of LYP/PTPN22 gene and latent autoimmune diabetes in adults(LADA) in Shanghai Chinese.

Methods: 229 unrelated LADA patients of Han Ethnics with positive autoantibodies to glutamic acid decarboxylase (DM group) and 100 healthy volunteers (control group) were recruited. Subjects of two groups were divided into male subgroup (n=100 vs 36) and female subgroup (n=129 vs 69). The genotypes of -1123G/C and +1858C/T polymorphism of PTPN22 were determined by PCR-restriction fragment length polymorphism (PCR-RFLP), the genotypic, allelic frequencies and the clinical characteristics were compared between two groups.

Results: Three genotypes, GG GC and CC, were detected for -1123G/T polymorphism of PTPN22 gene in Shanghai Han ethics. The most frequent genotype and allele of the PTPN22 -1123 were GC and C. Two genotypes, CC and CT, were detected, while no TT were detected for +1858C/T polymorphism. There was no significant difference in +1858C/T genotypic (CC, CT) and allelic frequencies(C,T) between control group and DM group($P>0.05$). However, significant difference of -1123G/C polymorphism of PTPN22 gene was observed between two groups (odds ratio[OR]=1.99, 95% CI=1.24-3.2, P=0.001). There were significant differences in -1123G/C genotypic(GG,GC,CC) between the male or female subgroups in DM and control group, and the G/C, C/C genotype is more likely in DM-male subgroup than in control-males(OR =1.65, 95% CI=1.21-2.26, P=0.005).

Conclusions: There is -1123G/C PTPN22 genotypic polymorphism in LADA patients of Shanghai Hans. The promoter -1123G/C SNP of PTPN22 gene, but not the +1858C/T variant, is associated with LADA in Han ethnics.

No conflict of interest

D-0649

Functional characterization of the rs1990760 SNP in IFIH1, a genetic locus associated with type 1 diabetes

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Background: Currently, over 177 million people worldwide are affected by diabetes. About 10% of the people with diabetes have type 1 diabetes (T1D), resulting from an auto-immune destruction of pancreatic insulin producing ß cells, due to the loss of immune tolerance. It has been established that T1D is a disease of complex etiology, due to both genetic and environmental factors involving genetic variation among individuals at several loci. One of these loci involves the association of T1D with rs1990760, a non-synonymous single nucleotide polymorphism (nsSNP) causing an Ala946Thr change in the interferon induced helicase gene (IFIH1). This gene is involved in antiviral innate immunity, and encodes an interferon-inducing protein with a helicase-C domain which binds viral double-stranded RNA and consequently induces a type I interferon (IFN) response. Given the autoimmune nature of T1D, possibly partially triggered by viral infections, IFIH1 is an interesting candidate for protein studies exploring allelic effects of this SNP on protein function, particularly IFN response.

Aim: We hypothesized that the T1D-predisposing Ala allele at the IFIH1 Ala949Thr polymorphism is associated with an enhanced cytokine response to dsRNA and we aimed to test this hypothesis in human lymphocytes.
Methods: 18 lymphoblastoid cell lines (LCLs) homozygous for the major predisposing genotype (Ala/Ala) and 6 LCLs homozygous for the minor protective genotype (Thr/Thr) were transfected by electroporation with polyI:C, a mimic of viral dsRNA, in three separate, independent experiments. Media was collected 24 hours later and subsequently measured for IFN-a production by sandwich ELISA.
Results: We found that the basal IFN response is minimal in mock-transfected cells from both genotypes and increases by about 8 fold in cells treated with polyI:C. Our results show that LCLs with the Thr/Thr genotype have slightly higher IFN-a levels than their Ala/Ala counterparts (66.56±9.44 vs. 61.24±17.34); however, this did not reach statistical significance. This suggests that there is no differential affinity for polyI:C between the two alleles.
Conclusion: We conclude that although the rs1990760 SNP does not seem to affect IFN response to polyI:C, this does not rule out the possibility of differential viral dsRNA recognition. Thus, the mechanism of the observed association of this SNP with T1D remains to be determined.

No conflict of interest

D-0650

Identification of the ENPP1 three-allele risk haplotype and its possible contribution to the development of obesity and insulin resistance in 8–18 year old learners in communities of the Western Cape, South Africa

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Background: The ENPP1 (nucleotide pyrophosphatase/phosphodiesterase-1) gene encodes a membrane-bound glycoprotein that inhibits the insulin receptor tyrosine kinase activity, resulting in reduced insulin sensitivity. There has been strong evidence from several previous studies that a common coding variant of ENPP1 (K121Q) and a three-marker haplotype (Q121, IVS20delT-11 and G + 1044TGA) are associated with a higher risk of glucose intolerance and type 2 diabetes as well as childhood obesity. Many different studies attempted to confirm the association in different population groups, but results have been controversial.
Aims: The aim of this study was to determine the role of the ENPP1 genetic variants in obesity and increased fasting plasma glucose in children from the Western Cape, South Africa.
Materials and methods: The study population consisted of 1,683 learners aged 8 – 18 years recruited randomly from public and government funded schools in the target areas within the Western Cape, South Africa. Anthropometric variables, blood pressure, fasting blood glucose and lipids were performed on all learners. From this group, all obese individuals (n = 110, 6.5% of total group) together with an age, gender and ethnic matched normal-weight control group were selected. We genotyped the three previously associated polymorphisms (K121Q, IVS20delT-11 and A/G + 1044TGA) for association analysis in these two groups.
Results: We identified a significantly increased risk of obesity in children carrying the G+1044TGA variant compared with the normal weight control group (p=0,011). The other variants showed no association with increased body mass index (BMI) with $p > 0,05$. No individual with the three-marker haplotype was identified in our study group. There were also no individual SNP or haplotype associations of the ENPP1 variation with increased fasting blood glucose in either the case or control group ($p > 0,05$).
Conclusion: Our study failed to replicate the association of variation of ENPP1 with impaired fasting glucose and obesity in children from the Western Cape, South Africa.

No conflict of interest

D-0651

Impact of coronary artery calcification as measure of subclinical atherosclerosis on validated genetic variants for type 2 diabetes mellitus – Results of the prospective Heinz Nixdorf Recall study

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Aims/hypothesis: Type 2 diabetes mellitus (T2D) is associated with a high risk of atherosclerosis and cardiovascular disease. Subsequently a higher burden of coronary artery calcification (CAC), a specific marker of coronary atherosclerosis, has been found in individuals with T2D. Recently, several genome-wide association (GWA) studies have robustly identified novel single nucleotide polymorphisms (SNP) related to T2D. Here we investigated the combined effect of the T2D SNPs and CAC for prevalent T2D cases in comparison with T2D-free controls in an unselected population-based cohort from Germany.
Methods: We genotyped 13 T2D SNPs in eight T2D candidate genes, including up- and downstream flanking sequences, using 4,459 participants (aged = 45-75 years; 610 (13.68%) with T2D; males n=2225 (49.90%) with 389 (17.48%) T2D; females n=2234 (50.10%) with 221 (9.89%) T2D) of the Heinz Nixdorf Recall Study. Odds ratios (ORs) were assessed by logistic regression models, adjusted for age, sex and in addition CAC.
Results: We observed an association between four SNPs and T2D, in particular SNPs in insulin-like growth factor 2 mRNA binding protein 2 (IGF2BP2), transcription factor 7-like 2 (TCF7L2), CDK5 regulatory subunit associated protein 1-like 1 (CDKAL1) and solute carrier family 30 (zinc transporter) (SLC30A8). ORs and p values for these associated SNPs ranged between ORs 1.16 to 1.30 ($p = 0.00011$ to 0.03). However, after adjusting for multiple testing by calculating false discovery rate, only SNPs in IGF2BP2 and TCF7L2 remained significant. Interestingly, when stratified for sex, we observed these effects only in males.
Conclusions: We confirm that genetic variants in *IGF2BP2* and *TCF7L2* are associated with T2D in our population-based cohort. Furthermore, the estimators for the genetic effects for T2D risk with involvement of CAC hardly changes, implying that these genetic variants are largely independent of the existence of subclinical atherosclerosis.

No conflict of interest

D-0652

Multifactor-dimensionality reduction shows a four-locus interaction associated with type 2 diabetes mellitus

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Background: The toll-like receptor 4 (TLR4) and inducible nitric oxide synthase (iNOS) are proteins from the innate immune system that, when activated, can induce insulin resistance. Polymorphisms in these genes could affect the immune response, as well as the prevalence of type 2 diabetes (T2DM).
Objective: The aim of the present study was to investigate the contribution, isolated or together, of four polymorphisms (Asp299Gly and Thr399Ile from *TLR4*; deletion (D)/ insertion (I) AAAT and (CCTTT)n from *NOS2*) to susceptibility to T2DM in a southeastern Brazilian population.
Design: A total of 211 patients with T2DM and 200 unrelated controls were genotyped for the Asp299Gly and Thr399Ile polymorphisms of the *TLR4* gene and for the deletion (D) / insertion (I) AAAT and (CCTTT)n polymorphisms of the *NOS2* promoter gene. Besides conventional statistics analysis, the data was also analyzed for gene-to-gene interactions among the four polymorphic loci using the multifactor-dimensionality reduction (MDR) method.
Results: With regard to the *NOS2* promoter region, data showed that the I allele of the deletion (D) / insertion (I) AAAT polymorphism was more prevalent

in the T2DM group (p= 0.039, OR= 1.7, 95% CI 1.02-2.86). Similarly, the L/L genotype of the (CCTTT)n polymorphism was more frequent in the T2DM group (p= 0.047, OR = 1.51, 95% CI 1.01–2.28). In contrast, the 299Gly allele and the 399Ile allele from the Asp299Gly and Thr399Ile *TLR4* gene polymorphisms, respectively, were associated with protection against T2DM (Asp299Gly: p= 0.023, OR= 0.45, 95% CI 0.19–0.99; Thr399Ile: p= 0.03, OR=0.25, 95% CI 0.07–0.9). The MDR analysis showed a significant gene-to-gene interaction between the four polymorphisms studied (p= 0.0048). Moreover, the combination of the *NOS2* deletion (D)/ insertion (I) AAAT D/I heterozygote, the *NOS2* (CCTTT)n (stratified in short and long forms) S/L heterozygote and the *TLR4* Asp299Gly Asp/Asp or Thr399Ile Thr/Thr, homozygotes was associated with an increased risk of T2DM. Additionally, the genotype combination of the *NOS2* deletion (D) / insertion (I) AAAT D/D homozygote, the *NOS2* (CCTTT)n (stratified in short and long forms) S/L heterozygote and the *TLR4* Asp299Gly Asp/Gly or Thr399Ile Thr/Ile, heterozygotes was associated with protection from T2DM.

Conclusions: Genetic variations in the *NOS2* gene promoter and *TLR4* coding sequence, when analyzed together or isolated, may lead to deleterious and protective effects, respectively, arising from altered function of the innate immune system in patients with T2DM.

No conflict of interest

D-0653

Molecular scanning of mtDNA gene in early onset maternal diabetic pedigrees

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Aims: To search for new potential diabetogenic mtDNA defects, we scanned the mtDNA genome in two early onset maternal diabetic pedigrees.

Methods: We screened early onset diabetic patients from in-patient and out-patient departments of Endocrinology and Metabolism from 2006. The whole mtDNA genome except D-loop were detected by direct sequencing in probands of suspected mtDNA mutated diabetic pedigrees. Novel mutation was identified by direct sequencing and then was screened in 200 non-diabetic controls and 100 early-onset diabetic patients.

Results: Two maternal diabetic pedigrees were recruited from 180 early-onset diabetes. These two families both had a maternal history, the probands were characterized by severely impaired ß cell function, sensory neuronal deafness, and low BMI. Affected family members all had relatively higher lactic acid concentrations and low insulin secretion. But we didn't find any pathogenic mutation by direct sequencing in No.1 family. In No.2 family, we found nt14319T/C mutation in the region of ND6 subunit. This mutation was heteroplasmic and has been not reported previously. The proband of this family characterized by severely impaired ß cell function and epileptic seizures. His affected mother had sensory neuronal hearing loss. Three members in the family had relatively higher lactic acid concentrations. The proband's mother and brother who were diabetics both carried this mutation. The frequencies of 14319T/C substitution in early-onset diabetes and control subjects were 6% and 5%, there were no significant differences between these two groups(P>0.05).

Conclusion: We didn't find pathogenic mutation in No.1 family by direct sequencing, this may because of heteroplasmic of mtDNA. Furthermore, we found a novel mutation 14319T/C in No.2 family, this mutation causes amino acid change (N to D). All three diabetic patients in this family harboured 14319T/C mutation, so we think it may be the major pathogenic mutation for this family.

No conflict of interest

D-0654

MODY diabetes in type-1 diabetic children

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MODY-type diabetes has been identified as type-2 diabetes, with early onset in young subjects, and affects 5-10% of type-2 diabetic subjects (Fajans, 2001). Mutations in HNF1A/MODY3 and HNF4A/MODY1 have been reported in both Latins and PIMAS indigenes in the 6-16 age range (Ríos Burrows et al., 1998a, 1998b). In Mexico, MODY has been studied in type-2 diabetic subjects in the 20-40 age range with an incidence of 1.5% (Aguilar-Salinas et al., 2001). These researchers consider the MODY genes are not the main cause of type-2 diabetes with early onset (Dominguez-Lopez et al., 2005). The objective of this work was to determine the incidence of MODY-type diabetes in children diagnosed with type-1 diabetes in the Hospital del Niño "Dr. Rodolfo Nieto Padron". 20 out of 40 children diagnosed with type-1 diabetes in 2006 were chosen from the department of endocrinology in the Hospital del Niño "Dr. Rodolfo Nieto Padron". Three genes were reviewed (HNF-1a, HNF-4a and GCK). Informed consent was given by the children's parents. The analysis of the genes was carried out in the molecular-diagnosis laboratories of the University. DNA was isolated from leucocytes in peripheral blood (Wizard® Genomic DNA kit, Promega, U.S.A). DNA concentration was verified by densitometry. 2 exons of each gene were amplified by PCR (Supermix, Promega U.S.A.). The primers were previously designed (Aguilar-Salinas, 2001). The amplified exons were purified from the 2%-agarose gel (kit Gene Clean, BIO-100), sequenced in an ABI Prism BigDye Mod. 3100, and analysed in BioEdit v.7.05.3 and GENBANK (http://www.ncbi.nlm.nih.gov/blast/Blast.cgi). Mutations were corroborated with a second anti-sense sequence. From the HNF1A/exon 7 gene, a sense mutation was identified (L456L) C/A allele. This mutation was found in 5 children with an incidence of 25%. A missense mutation with G/A allele in this exon was also localized in three children; one of these children was observed with two alleles. This mutation has not been associated with functional alterations of beta cells (Rissanen, 2000). A missense mutation (R254H) from the HNF4A/exon 4 gene was identified. This mutation has not been reported ever before with G/A allele in two children aged 2 and 6. This polymorphism is localized in the alpha helix 7, site of adhesion recognized as conserved domain of the hormone receptor (Ryffel, 2001). No mutations in the exons of the KCG/MODY2 gene were identified. In conclusion, only 10% of the children subjects could have MODY-type diabetes and the other mutations could be considered as markers of diabetes in the type-1 diabetic population (Domínguez-López et al., 2005).

No conflict of interest

HEALTHCARE AND EPIDEMIOLOGY

Screening

D-0655

Depression and/or diabetes-related distress in the cross-national DAWN MIND study: the importance of understanding different needs

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Backgound: The prevalence of uni-polar depression (DEP) is twice as high among people with Type 1 and Type 2 diabetes relative to the general population, affecting approximately 10-20% of the patients. DEP is associated with suffering, poor clinical outcomes and high costs. It is unclear to what extent DEP is related to high diabetes-specific distress (DSD) and if anti-depressant treatment should address DSD. In the context of the cross-national DAWN MIND (Monitoring of Individual Needs in Diabetes) study, patients are screened for DEP and DSD using validated self-report measures as part of ongoing diabetes care, along with socio-demographic and clinical parameters.

Aims: To explore the relationship between DEP and DSD and differentiate between different subgroups on the basis of the existence or absence of DEP and/or DSD. Such differentiation may help to clarify the relevance of perceived diabetes-specific burden in the etiology and management of DEP in people with diabetes.
Methods: Cross-sectional data were collected in 1131 diabetes patients from diabetes care centres in 9 countries. Frequencies of DEP and DSD were tested using established cut-off scores of the World Health Organisation-5 item Well-being Index (WHO-5 score <29) and the Problem Areas In Diabetes (PAID score > 39) scale, as measures of DEP and DSD respectively. Group differences on demographic and clinical variables were tested for 4 sub-groups: a) No DEP and No DSD, b) DEP, no DSD, c) DEP and DSD, and d) No DEP, DSD.
Results: Correlation between WHO-5 and PAID was -.443 ($p<0.01$), confirming they are related but not interchangeable. Both measures showed weak but significant associations (*r* -.077 and .122 resp.) with HbA1c, in the expected direction. Over 1/4 (26.2%, n=296) of the patients reported to be depressed and/or distressed. 15.6% had DSD but no DEP; 5.5.% had DEP alone (n=62), 5.1% combined DEP with DSD (n=58). Comparing DEP with and without DSD revealed that the combined DEP/DSD group comprised more females, but no other striking differences. DEP/DSD had poorest glycemic control of all groups and significantly worse than those with no DEP nor DSD (8.6% ± 2.1 vs. 7.9%± 1.5, $p<.05$).
Discussion/conclusion: Approximately 1: 4 diabetes patients has serious psychological issues that warrant clinical attention. Questionnaires such as WHO-5 and PAID can help clinicians distinguish between those affected by depression or diabetes-related distress only, and those with a combined problem. Those affected by depresion and diabetes distress had the worst glycemic control, suggesting they have the greatest difficulty self-managing their diabetes. Addressing diabetes distress in treating their depression would seem essential. Our findings underscore the importance of assessing patients' individual needs to help tailor psychological services in the context of diabetes care.

No conflict of interest

D-0656

The PAID-5: A valid and reliable short-form measure of diabetes-distress developed from the DAWN MIND study.

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Background: Emotional distress is common in diabetes patients but poorly recognized by health care professionals and undertreated. The DAWN MIND (Monitoring of Individual Needs in Diabetes) study is a cross-national implementation project, promoting systematic evaluation of the psychological status of patients in diabetes clinics and improvement of psychosocial care.
Aim: There is a need for short, valid instruments that can be used in busy diabetes clinics by non-mental health specialists to screen patients for psychological distress. We sought to develop and validate a 5-item short form of the 20-item Problem Areas In Diabetes (PAID) scale, a widely used and well-validated measure of diabetes-related emotional distress.
Methods: Data from 1153 participants of the DAWN MIND study were available on the PAID questionnaire and WHO-5 (World Health Organisation 5 item Well-being Index) along with socio-demographic and biomedical characteristics. Mean age 53.8 years (SD 14.7), 52.1% female, 63.2% Type 2 diabetes; 54.9% reported no complications, 20.4% 2 or more complications. Two random sub-samples were created (sample 1: n=589 and sample 2: n=564) for psychometric testing, including descriptive statistics, Principal Components Factor Analysis (PCA), Explorative Factor Analysis (EFA), tests of internal consistency and validity. Receiver Operator Characteristics (ROC) analysis was performed to test for diagnostic accuracy.
Results: Based on PCA in sample 1, 10 items from the full PAID were identified constituting a negative emotions scale, from which 5 were retained after reliability analysis (alpha .86, 95% CI=.84-.88). Average score 6.07 (SD 5.09, 0-20). Convergent and construct validity of PAID-5 were confirmed with WHO-5 ($r=-.47, p<.001$) and females reporting higher PAID-5 scores then males ($p<.001$). Patients with complications tend to report more distress than those without complications. These data were confirmed in sample 2. Diagnostic accuracy was tested by ROC analysis, showing 94% sensitivity and 89% specificity for using as cut-off PAID-5 score of >7 against established criterion score for high distress of full PAID.
Conclusion: We have identified a brief, user friendly and reliable measure of diabetes-specific emotional distress, that should prove useful in busy practices, taking 1 minute maximum to complete and offering a clear cut-off score for clinically relevant levels of diabetes distress. The PAID-5 is an excellent candidate for systematic screening in ongoing diabetes care as recommended by the ADA and IDF, either alone or combined with a measure of general well-being such as the WHO-5.

No conflict of interest

D-0657

Missed diagnosis with fasting plasma glucose: the case for a screening questionnaire

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Three Canadian provinces participated in a pilot project to field test the initial version of the CANRISK survey (July 2007). CANRISK is a risk-scoring questionnaire based on Finland's FINRISK which is being further evaluated in other Canadian provinces by the Public Health Agency of Canada. The pilot included 997 participants in New Brunswick (NB), Prince Edward Island (PE) and Saskatchewan (SK) with undiagnosed diabetes over the age of 40 (only 3% of the participants were under 40). All participants completed both the CANRISK survey and 75-g oral glucose tolerance test (OGTT). There were 204 participants (20.5%) with abnormal fasting plasma glucose (FPG) or OGTT results, according to Canadian Diabetes Association (CDA) definitions. Prediabetes and diabetes was diagnosed in 154 participants (15.5%) and 50 participants (5.0%) respectively.
The CDA 2008 Clinical Practice Guidelines recommends screening for diabetes using FPG over age 40. A 2-hour plasma glucose (2hPG) in a 75-g OGTT is indicated when FPG is 6.1-6.9 mmol/L (impaired fasting glucose (IFG)) and may be indicated when the FPG is 5.6-6.0 mmol/L and risk factors for type 2 diabetes are present.
Had FPG been the only screening performed in this study population, IFG would have been diagnosed in 63 cases. 91 participants with isolated impaired glucose tolerance (IGT) would not have been recognized, representing 59% of those with prediabetes. FPG alone would have recognized 26 cases of diabetes; however, 24 participants with diabetes (48%) would not have been diagnosed. If OGTTs were conducted on the 76 participants with FPG between 6.1-6.9 mmol/L, 41 participants would have been recognized with isolated IFG, 26 with both IFG and IGT and 9 new diagnosis of diabetes would have been made. An OGTT for those with IFG increases prediabetes and diabetes case detection to 59 (38%) and 35 (70%), respectively.
CDA guidelines suggest OGTT if FPG is 5.6-6.0 mmol/L with risk factors. Given that a majority of participants were over the age of 40 with multiple risk factors, all were assumed to be at risk. Following the guidelines, 112 additional OGTTs would have been performed resulting in 28 additional cases of prediabetes (isolated IGT) and 8 additional cases of diabetes. These recommendations improved prediabetes and diabetes case detection to 87 (56%) and 43 (86%), respectively.
Even strict adherence to the CDA screening guidelines missed 63 (44%) of prediabetes and 7 (14%) of diabetes cases. 70 participants (7%) with either prediabetes or diabetes had FPG values $\leq$ 5.5 mmol/L.

Four questions from CANRISK (waist circumference, age, history of abnormal blood sugar, and history of high blood pressure) were sensitive (73%) and specific (67%) using a pre-determined scoring system to identify prediabetes and diabetes, and may be helpful in determining those people who would benefit from OGTT.

No conflict of interest

D-0658

Fetuin-A is a good predictor to detect impaired glucose tolerance in elderly people of Japanese population (Tottori-Kofu study)

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Aims: Fetuin-A is a hepatic secretory protein that induces insulin resistance in vitro, and several studies reported higher Fetuin-A levels were associated with insulin resistance and incident diabetes in human. So, we presumed that Fetuin-A could be a good predictor to detect impaired glucose tolerance (IGT).
Methods: We conducted medical examination of 1033 inhabitants in resident of rural area in Japanese population (Kofu-town, Tottori, Japan). The 75g oral glucose tolerance test (75g-OGTT) was applied to 251 high risk participants (age:68.2, M/F:91/160) with FPG>=95mg/dl (5.3mmol/l), or with FPG<95mg/dl and having any other following criteria, HbA_{1C}>=5.3%, BMI=>25 kg/m^2, TG>=150 mg/dl (1.7mmol/l), and Hypertension treatment in 2006. 74 IGT subjects and 7 diabetes subjects, total 81 patients (32%) were detected with glucose intolerance in 251 high risk participants. In this study, we retrospectively measured Fetuin-A level in preload serum among 251 participants applied OGTT.
Results: The optimal cut-off value of Fetuin-A to detect IGT was 230µg/ml using ROC curve (sensitivity 74%, specificity 42%). From logistic analysis, participants with Fetuin-A>=230µg/ml had a significantly higher risk of incident IGT compared with participants with Fetuin-A<230µg/ml in models adjusted for age, gender, and whether having FPG=95mg/dl, HbA_{1C}>=5.3%, BMI>=25 kg/m^2, TG>=150 mg/dl, and Hypertension treatment (adjusted hazard ratio, 2.68; 95% confidence interval, 1.17-6.16; P=0.02)(Table1). According to multi-regression analysis, Fetuin-A level is reversely correlated with age.
Discussion/conclusion: We speculate the high Fetuin-A level in elderly could be the marker to predict the latent IGT. In elderly people of Japan, IGT is one of important metabolic risk factors for cardiovascular events. It is necessary to find the efficient and economical way to detect IGT in early phase. Our results indicate that Fetuin-A is a good predictor to detect IGT in elderly residents in Japanese population.

NGT/IGT/DM=Total (75gOGTT is applied)	hazard ratio of High Fetuin-A (>=230µg/ml) for IGT	95% CI
170/74/7=251	2.68 (P=0.02)	1.17-6.16

No conflict of interest

D-0659

Association between health behaviors, waist circumference and components of the metabolic syndrome in school children in Argentina

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Background: There is growing interest in understanding the role that lifestyle behaviors play in relation to children's weight status.
Objective: To determine the association between children's waist circumference (WC), health behaviors, and components of the metabolic syndrome.
Methods: 1065 students (535M) aged 9.54 ± 2.08 years from 6 suburban elementary schools, were examined between April 2007and March 2008. Mothers were asked about their children's lifestyle. A simple 5-level index ranked participants' daily consumption of vegetables or fruits portions, glasses of milk, sweetened beverages, blocks walked, breakfast intake, and TV viewing. We assigned a score of 0 for unhealthy and 1 for healthy (above or below median level). Thus the healthy behavior score for the 6 components had a range from 0 (unhealthy) to 6 (healthy). Data also included parental education levels socioeconomic status, children's BMI, WC, blood pressure (BP), Tanner stage, fasting lipids, insulin, and glucose. We also created two groups for WC $\geq$ or < 90t^h percentile.
Results: All families were in the low socio-economic class: 77.8 % of parents had an elementary education or less, 7.8% of the families did not have a refrigerator and 4.1% had a dirt floor. One hundred and sixty five (15.5%) of children were obese (OB) (BMI$\geq$95%ile per CDC norms), and 152 (14.3%) overweight (OW) (BMI>85<95%ile). The prevalence of WC$\geq$90th percentile was 24.6% (262). 58.4% of the children were at Tanner 1. The median daily intake of sweet beverages was 4, of fruit and vegetables 2, and of milk 2. The median number of blocks walked daily was 10 and the median hours of TV watched daily was 3. Children with WC$\geq$90 showed significantly lower scores for healthy habits than children with WC<90 (Chi-Square 16.04; p= 0.014). Mean values of triglycerides (91.37 vs 69.79 mg/dL), systolic BP (98.35 vs 90.71mm Hg), diastolic BP(59.93 vs 55.40) and HOMA-IR (1.44 vs 0.75) were significantly higher while HDL-C (46.49 vs 52.85) and healthy score (2.55 vs 2.80) were significantly lower in the group of children with WC$\geq$90 than in the other group. Multiple regression analysis showed a positive association between children's WC, HOMA-IR (B=5.36; p<0.01), sex (B=3.04; p<0.01) and Tanner (B=4.13; p<0.001), and a negative association with healthy lifestyle's score (B=-0.69; p=0.016) (R^2 0.38).
Conclusions: Our results suggest that insulin-resistance, sex and puberty are positively associated with childhood central OB while healthy habits are inversely associated. Most of these behaviors can be modified, suggesting opportunities for preventive intervention during childhood to avoid the development of metabolic disease.

No conflict of interest

D-0660

Screening glucose challenge test in pregnancy: impact of family history of diabetes on the likelihood of a false-negative result

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Introduction: The glucose challenge test (GCT) is commonly used as a screening test for gestational diabetes mellitus (GDM). Women with a 1-hour plasma glucose of > or =7.8 mmol/l after a 50-g oral glucose load (positive test) proceed to an oral glucose tolerance test (OGTT) for definitive diagnosis. Women with a normal GCT do not undergo further metabolic testing; however, some of these women subsequently develop GDM or gestational impaired glucose tolerance (GIGT). These women are typically not identified in clinical practice. The aim of this study was, therefore, to identify clinical characteristics of women with a false-negative GCT that might be predictive of an increased risk of the later development of GIGT or GDM.
Methods: In a prospective longitudinal cohort study, 124 women with a normal GCT screening test subsequently underwent a diagnostic three-hour 100g OGTT in pregnancy and a 75 g OGTT at 3 months postpartum. These women were stratified into two groups based on the OGTT results in pregnancy: (i) those who maintained normal glucose tolerance (NGT, n=93) and (ii) those who were diagnosed with GIGT or GDM (i.e. false-negative screening GCT, n=31).
Results: At the time of GCT screening, age, ethnicity, pre-pregnancy BMI and GCT 1-hour glucose values were not significantly different between the two groups. However, women with a false-negative GCT were more likely to have a family history of diabetes than were women with NGT in pregnancy (64.5% versus 41.9%, p=0.03). At the OGTT at 3 months postpartum, the false-negative GCT group also exhibited significantly higher fasting and 2-hour glucose values, lower insulin sensitivity and poorer beta-cell function compared to women with NGT. Furthermore, 12.9% of women with a false-negative GCT were found to have pre-diabetes on postpartum testing compared to 3.2% in the NGT group (p=0.06). Amongst clinical characteristics at the time of the GCT, the GCT 1-hour glucose value was not significantly associated with subsequent GIGT/GDM (odds ratio (OR) 1.45, 95% confidence interval (CI) 0.95-2.22, p=0.08), whereas family history of diabetes was a significant

predictor of glucose intolerance in pregnancy (OR 2.37, 95% CI 1.01-5.57, p=0.048). Indeed, for identifying women at risk of GIGT/GDM, the GCT was informative in women with no family history of diabetes (area-under-the-receiver-operating-characteristic-curve (AROC) 0.71), but it was of limited value in women with a family history of diabetes mellitus (AROC 0.54).
Conclusion: A normal GCT screening test may be falsely negative in women with a family history of diabetes. Further metabolic testing in pregnancy should be considered in these women.

No conflict of interest

D-0661

Autoimmunity against REG family antigens in Japanese diabetes patients

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Aims: ß-cell regeneration is induced by Reg, via an autocrine/paracrine mechanism. Recombinant REG was shown to ameliorate diabetes in 90% depancreatised rats and non-obese diabetes mice. Human *REG* family is comprised of five genes (viz; *REG Iα*, *REG Iß*, *REG III*, *HIP/PAP* and *REG IV*). The gene structure consisting of 6 exons and 5 introns, is common in all five members, that encodes homologous 158-175 amino acids secretory proteins expressed during tissue injury and regeneration. Previously we identified antibodies to REG Iα in Japanese Type 1 and Type 2 diabetes patients showing significant correlation with the duration of diabetes and ages of patients at the onset of the disease. The existing sequence homology and similarity in expression pattern between the REG family members draws much interest in identifying autoimmunity against other REG family proteins, and to understand their association with autoimmune diseases, if any. Presently, we analysed the presence of autoimmunity to REG Iß, REG III, HIP/PAP and REG IV and their correlation with diabetes in Japanese sera.
Methods: Sera from 300 diabetes subjects and 75 healthy controls were drawn at Tohoku University Hospital (Sendai, Japan) after obtaining their consent for purpose of study. The cDNA of each *REG* gene was cloned into pTriEX-4 multiple expression system vector with conjugated S-tag sequence at N-terminal to facilitate one-step affinity purification on S-Protein agarose (Novagen®). Autoantibodies to REG proteins were screened by Western Analysis. Each purified REG protein was electrophoresed on SDS-polyacrylamide gel, electrotransferred to PVDF membrane and blocked with milk solution before incubating with patient sera as primary antibody. HRP conjugated anti-human monoclonal IgG (American Qualex) was used as secondary antibody. Signal was detected by ECL Plus Western Blotting System (GE Healthcare). Signal intensity from each patient serum was analysed by densitometry, using ImageJ software. Statistical significance of the occurence of anti-REG autoimmunity in patient sera and its correlation with the general characteristics of diabetes patients was analysed by Chi-squared test, Student's *t*-test, simple regression analyses and ANOVA analyses.
Results: We found autoimmunity against REG Iß in 10% of Type 1, 32% of Type 2, and 2.7% of non-diabetes controls ($P = 0.001$), and against REG III in 15% of Type 1, 20% of Type 2, and 1.4% of non-diabetes controls ($P = 0.0001$). There was significant difference between anti-REG Iß positive (39.8 ± 1.6) and negative (33.5 ± 1.0) groups in age at onset of disease ($P = 0.0024$). No autoantibodies were detected against HIP/PAP and REG IV in diabetes patient sera.
Conclusion: These results suggest that autoimmunity against REG family proteins may be associated with diabetes, thus REG family members may serve as separate biomarkers.

No conflict of interest

D-0662

Is gestational diabetes a good predictor of abnormal glucose metabolism among Canadian Aborigines?

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Type 2 diabetes (T2D) reaches epidemic proportions in many of Canada's First Nations and Indian Cree populations. Nevertheless, Inuit from Nunavik show a low prevalence of T2D. Gestational diabetes (GDM) has been proposed as a predictor of T2D in various populations particularly among Cree from James Bay region. Moreover, GDM is highly prevalent among Indian Cree population; yet, the impacts of GDM on T2D among Canada's First Nations population are poorly investigated.
Aims: To identify the impact of a history of GDM on the suboptimal glucose metabolism among Canadian First Nations women.
Methods: Study participants were recruited during two different health surveys conducted between 2004-2008 in the Nunavik and James Bay regions (Québec, Canada). Participants included in the current analysis comprised 419 Inuit and 176 Cree adult women (18-74 years) who previously gave birth. History of GDM and T2D was obtained from medical records for each participant. Women with either T2D or impaired fasting glucose (obtained from blood fasting glucose measurements at the time of recruitment) were classified as having a postpartum suboptimal glucose metabolism. Comparisons between the two ethnic groups were performed by Ancova and the influence of GDM on suboptimal glucose was determined by logistic regression analyses.
Results: Among all participants, 6.5% had a history of GDM; this proportion was not statistically different between ethnic groups (Inuit: 6.7% vs. Cree: 5.9% ; p=0.73). Women with prior GDM showed higher plasma total-cholesterol, LDL-cholesterol and triglycerides concentrations ($p<0.05$). The prevalence of a suboptimal glucose metabolism among participants was 13.2% and this proportion was significantly higher among Cree(30.1% vs. 7.1%, $p<0.0001$). Cree women also showed a metabolic profile that is more deteriorated, as they show higher waist circumference (110 vs. 91 cm, $p<0.0001$), higher plasma triglycerides levels (1.5 *vs.* 1.0 mmol/L,$p<0.0001$), lower plasma HDL-cholesterol levels (1.3 *vs.* 1.8 mmol/L, $p<0.0001$) and higher systolic blood pressure (120 *vs.* 114 mmHg, $p<0.0001$) compared to Inuit women. Adjusted logistic regression revealed that a GDM history predicted significantly the likelihood of having a suboptimal glucose metabolism (OR: 3.9 [1.5-9.8]). This association was markedly seen among Inuit women (OR: 7.7 [2.6-22.2]).
Conclusion: Among Canadian Cree and Inuit women, GDM history is associated with a suboptimal glucose metabolism as previously shown in other populations at risk. Moreover, our results suggest that among a population such as the Cree, showing a high prevalence of T2D and associated metabolic diseases, GDM history has less impact on suboptimal glucose metabolism.

No conflict of interest

D-0663

Derivation of BMI and waist circumference cut-off values for Sri Lankan adults

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Introduction: Anthropometric cut-off values derived for Caucasians would be less sensitive to define obesity in Non-Caucasians. We aimed to derive BMI and WC cut-offs for Sri Lankan adults.
Methods: Data were from a nationally representative sample of 4276 subjects without known diabetes. Presence of = 2 of dysglycaemia (fasting glucose =5.6mmol/l; 2-hr post OGTT glucose =7.8mmol/l), elevated blood pressure

(=130/85mmHg/antihypertensive therapy), low HDLC (males <1.03mmol/l; females <1.3mmol/l) and elevated triglycerides (>1.7mmol/l) was considered as having high cardiovascular disease (CVD) risk. Receiver operating characteristic (ROC) curve analysis was performed using SPSS to identify BMI and WC cut-offs with optimal sensitivity and specificity to predict high CVD risk.

Results: The mean age, BMI and WC were 45.2 years, 21.8kg/m^2 and 77.7cm. The area under the curve (AUC) for BMI for both males (M) and females (F) were 0.71 (P<0.001). AUC for WC were M: 0.71, F: 0.72 (p<0.001). The BMI cut-off for all adults was 21.5kg/m^2 and that for males and females were 20.7 kg/m^2 and 22.0 kg/m^2 respectively. The WC cut-off for men and women were 76.5cm and 76.3cm respectively. The sensitivity for the new BMI cut-off in predicting high CVD risk was 66% compared to 34% for the cut-off for overweight (25kg/m^2) for Caucasians. The sensitivities for newly derived WC cut-offs were 76% for males and 72% for females compared to the recommended cut-off values by the International Diabetes Federation for Asians (male: 90cm - sensitivity 27%, female: 80cm - sensitivity 57%)

Conclusions: Population specific anthropometric cut-offs are more sensitive in identifying those with higher CVD risk in Sri Lankans compared to those derived for Caucasians.

No conflict of interest

D-0664

Making it Work - addressing program implementation challenges in Indigenous communities

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Aims: While there is evidence demonstrating the effectiveness of diabetes self-management programs in Indigenous populations, there are also implementation challenges, notably: remote locations with small populations, cultural and ethnic diversity, and complex issues of poverty. The aim of this research was to identify and understand these specific challenges, and develop strategies for successful implementation of community self-management programs.

Methods: Between 2005 and 2009 a team from University of Victoria conducted four sequential studies examining this challenge in First Nations communities in British Columbia, Canada. Using qualitative methodology, the 2005 study elicited perspectives on program processes and materials, training, and implementation processes from community leaders. The 2006 study focused on the use of information and skills in the communities following program implementation, and ways to make the materials more culturally appropriate. The focus for the 2007 study was to examine the effectiveness of various support strategies to enhance program implementation. Lastly, the 2008 study addressed issues of program sustainability.

Results: Following program implementation, participants reported using the information and skills in a variety of ways. They learned skills of action planning and goal setting which could be used beyond the management of diabetes and other chronic conditions. Participants provided suggestions relating to program format and content, acceptability of training community members as Leaders, and language and cultural considerations. An Aboriginal Liaison Coordinator was hired with a focus on building relationships with communities and volunteer leaders. The findings led to modifications in training materials, including the addition of artwork and colours in the manuals and charts, resource examples from First Nations communities, and the development of a First Nations brochure and poster. To ensure sustainability, participants identified the need to provide adequate funding for transportation, rooms and promotion.

Conclusion: Self-management programs for persons living with diabetes in First Nations communities can be delivered in a culturally acceptable way.

No conflict of interest

Complications - eye

D-0665

Role of Ox-LDL immunocomplexes in diabetic retinopathy

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Extravasated and oxidized low-density lipoprotein (LDL) have been identified in the retina in diabetes, and implicated in diabetic retinopathy (DR) in our recent cell culture and immunohistochemical studies. Oxidized LDL may be immunogenic, resulting in the formation of ox-LDL immunocomplexes (LDL-IC) containing IgG/M – and such complexes have recently been implicated in atherogenesis. In the current study, we investigated whether LDL-IC are associated with the initiation and progression of DR. Immunostaining of ox-LDL and IgG/M was performed in retinal sections from four different groups of human subjects: non-diabetic; (Type 2) diabetic without clinical retinopathy; diabetic with moderate non-proliferative diabetic retinopathy (NPDR); diabetic with proliferative diabetic retinopathy (PDR). Ox-LDL and IgG/M was absent in non-diabetic subjects but present in all three diabetic groups, increasing with severity of DR. Merged images revealed co-localization of ox-LDL and IgG/M. In cell culture studies, induction of apoptosis by human LDL-IC in human retinal capillary pericytes (HRCP) was assessed. Human LDL-IC (50 mg/L) significantly attenuated viability in HRCP at 6 and 24 hrs. In contrast, rabbit LDL-IC and ox-LDL (50 mg/L) did not induce this effect (however ox-LDL also triggered apoptosis, but at higher concentrations). The apoptotic mechanisms were related to PARP pathways and caspase cascade activation. The data suggest a potentially important role for LDL-IC, formed after extravasation and oxidation of LDL in the retina, in promoting an early feature of DR, pericyte loss by apoptosis.

No conflict of interest

D-0666

Mechanisms of oxidized and glycated LDL induced human retinal capillary pericyte loss: oxidative stress, proteasome inhibition and mitochondrial–mediated apoptosis

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Loss of retinal pericytes due to apoptosis plays a central role in the development of diabetic retinopathy (DR). Our previous studies have demonstrated that intra-retinal highly oxidized-glycated LDL (HOG-LDL), formed from LDL extravasated through a leaking inner blood retinal barrier, may be important in promoting apoptosis of human retinal capillary pericytes (HRCP). In this study, we investigated potential mechanisms by which HOG-LDL induces apoptosis in HRCP. In cultured cells, HOG-LDL (200 mg/L) increased levels of intracellular reactive oxygen species (P<0.01, n=3) and 3-nitrotyrosine (P<0.05, n=3), and decreased glutathione peroxidase-1 (P<0.05, n=3). Also, HOG-LDL reduced the activity of proteasome (P<0.05, n=3) (which is responsible for degrading activated pro-apoptotic Bcl-2 proteins), enhanced Bax translocation to mitochondria as detected by a reduced level of Bax in cytosol (P<0.05, n=3) and an enhanced level of Bax in membrane (P<0.05, n=3). Further, HOG-LDL increased cytosolic cytochrome c (P<0.05, n=3), and apoptosis-inducing factor (P<0.05, n=3). In contrast, treatment with N-LDL (200 mg/L) did not induce any of these changes. In *ex-vivo* studies, co-staining of oxidized LDL and Bax was demonstrated in the ganglion cell and the inner and outer nuclear layers in retinae from human diabetic subjects with non-proliferative diabetic

retinopathy, but was absent in retinae from non-diabetic subjects. We conclude that in the development of DR, HOG-LDL may mediate pericyte loss through enhanced oxidative stress, proteasome inhibition, and mitochondrial-mediated apoptosis.

No conflict of interest

D-0667

Declining prevalence of visual impairment among people with diabetes in the United States, 1997–2007

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Aim: Diabetes can lead to impaired vision and blindness. We examined trends in the prevalence of visual impairment (VI) among adults with diabetes in the United States.
Methods: Using 1997-2007 data from the National Health Interview Survey, we calculated the prevalence of VI among people aged 18 years or older with self-reported diabetes. VI was defined as having trouble seeing even when wearing glasses or contact lenses. Data were analyzed by age, sex, and race or ethnicity using single years of data. The race groups included people of both Hispanic and non-Hispanic origin; people of Hispanic origin may be of any race. Rates were age-adjusted based on the 2000 U.S. standard population. We examined trends using joinpoint regression analysis and each trend in the final model was described by an annual percentage change (APC).
Results: Among people with self-reported diabetes, VI increased from 2.6 million in 1997 to 3.2 million in 2007. However, throughout the period, crude and age-adjusted VI prevalence decreased significantly among people with diabetes, with the age-adjusted prevalence dropping from 23.9% to 18.3% (APC = -3.3%, p<0.001). The declines in crude and age-adjusted prevalence were similar, suggesting that the aging of the population had little effect on trends. Between 1997 and 2007, although not always significant, VI prevalence decreased steadily across the demographic groups examined.
Prevalence of VI among adults with self-reported diabetes and APC, by age, sex, and race or ethnicity, United States, 1997–2007

	Percentage		Trend		
	1997	2007	APC	95% CI*	p value
Age					
18–44	21.0	17.7	-3.4	(-7.0, 0.3)	0.07
45–64	25.6	18.3	-3.4	(-4.8, -2.0)	<0.001
65–74	26.4	19.0	-1.9	(-4.2, 0.6)	0.12
>=75	33.2	21.6	-2.5	(-4.7, -0.3)	0.03
Age-adjusted					
Men	22.2	16.4	-2.7	(-4.8, -0.5)	0.02
Women	25.3	20.1	-3.8	(-5.4, -2.0)	<0.001
White	22.8	19.2	-2.7	(-4.1, -1.3)	0.002
Black	27.4	18.6	-3.4	(-7.0, 0.3)	0.07
Hispanic	24.7	14.5	-2.6	(-5.5, 0.4)	0.08

*CI=confidence interval

Conclusion: Between 1997 and 2007, the prevalence of VI among people with diabetes declined. This encouraging trend was likely due in part to a reduction in VI risk factors, improved detection and treatment of eye problems, and other factors. Continued efforts are needed to improve and sustain the decline.

No conflict of interest

D-0668

Elevated glucose activates the P38 MAP kinase pathway in cultured human retinal pigment epithelial cells

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Purpose: Proliferative diabetic retinopathy (PDR) is a serious complication of diabetes that can result in blindness. Elevated glucose, as seen in diabetes mellitus, activates the p38 mitogen-activated protein kinase (P38) pathway in various kinds of cells. Since retinal pigment epithelial cells (hRPE) have been implicated in the pathogenesis of PDR, we examined the production of P38 in cultured hRPE cells under high glucose conditions.
Methods: hRPE cells were isolated and cultured from three human eyes. The hRPE were exposed to fetal bovine serum (FBS) (0-10%) and FBS (10%) supplemented with 20mM glucose for 48 hours with or without SB203580, an inhibitor of P38. Some experimental hRPE cells were labeled with 14C-methionine to assess P38 production by immunoprecipitation of 14C-methionine p38 (14C-P38) with anti-P38. hRPE viability and proliferation were evaluated by trypan blue exclusion method (T) and 3H-thymidine (3H-thy) incorporation respectively. Light microscopy was done to assess cell phenotype. Data were analyzed by student t-test. $p < 0.05$ was considered as significant difference.
Results: hRPE cells studied in FBS (0-10%) with or without high (20mM) glucose showed similar epitheloid phenotype and remained viable as determined by T. Increasing concentrations of FBS stimulated hRPE proliferation in a dose dependent manner as determined by 3H-thy. Increasing concentration of FBS also stimulated 14C-P38 production in a dose dependent manner. FBS (10%)+ high glucose (20 mM) stimulated significantly greater 14C-P38 production compared to FBS (10%) alone (2106.40±107.12 vs. 1127.00±400.43, CPM±SEM, n=4, p=0.01). FBS (10%)+glucose (20 mM)+SB203580 (20μM) stimulated 14C-P38 even greater production compared to FBS (10%)+glucose (20 mM) alone (2654.69±333.88 vs. 2198.36±226.23, CPM±SEM, n=4, p=0.02). In addition, exposure of hRPE cells to high glucose stimulated increased proliferation, as measured by 3H-thy incorporation, in parallel with the increased 14C-P38 production.
Conclusion: Exposure of hRPE cells to elevated glucose stimulates increased proliferation as well as increased P38 production. This activation of the P38 MAP Kinase pathway may play a role in the pathogenesis of PDR.

No conflict of interest

D-0669

MicroRNA 146a in diabetic retinopathy

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Aims: Glucose induced multiple signalling mechanisms may cause tissue damage in diabetic retinopathy (DR). Endothelial cells (ECs) play an important role in the pathogensis of DR. We have previously demonstrated glucose induced alteration of transcription factors, fibronectin (FN) and endothelin-1 (ET-1) in ECs and in the retina in diabetes. At the nuclear level, microRNAs (miRNAs), through transcriptional regulation, influence a large number of cellular processes and may influence the pathogenesis of several disease processes. However, exact role of miRNAs in diabetic complications such as DR have not been studied. We investigated glucose induced miRNAs alteration and their downstream effects in ECs and in DR.
Methods: miRNAs microchip arrays was used to examine alteration of miRNAs expression in human umbilical vein endothelial cells (HUVEC), exposed to glucose. Specific miRNA expression (miR146a), identified on the array analysis, was validated by TaqMan™ PCR. Real time PCR was used to determine mRNA expression of selected targets, FN and ET-1, in glucose exposed cells with or without miR mimic transfection. ERK1/2, another target of miR146a, was analysed. Retinas from the STZ induced diabetic rats were also analysed for miR146a alteration.
Results: Array analysis demonstrated glucose induced alterations of 231 miRNAs (out of a total of 733 miRNAs) in HUVECS exposed to 25mM glucose (HG) for 24 hours. Three were upregulated and 228 were downregulated. Twenty five mM glucose (HG) caused significant decrease in miR146a expression compared to 5mM glucose (LG). Simultaneously, HG caused increased ERK1/2 protein levels, ERK phosphorylation and augmented mRNA expression of FN and ET-1. Retinas from the STZ-induced diabetic rats also showed decreased miR146a and other changes similar to ECs. Transfection with miR146a mimics increased miR146a levels. Furthermore, all aforesaid mRNA and protein alterations were prevented by such transfection.
Discussion/conclusion: Data from these studies demonstrate a novel glucose-induced molecular mechanism in which miRNAs may participate in the transcriptional circuitry regulating downstream gene expressions in diabetes. It is important to identify such mechanisms that may lead to potential novel RNA based treatment target for DR and other diabetic complications.

No conflict of interest

D-0670

Expression of RAX and microRNA 29b in the Retina of Diabetic Rats: Implications for Apoptosis of Retinal Neurons

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Diabetic retinopathy is one of the most common complications of diabetes, but the molecular mechanisms underlying this ocular pathology are only partly understood. Accumulating evidence indicates that apoptosis of retinal neurons precede the microvascular alterations in retina in both diabetic patients and streptozotocin-induced diabetic retinopathy. It is known that RAX, an activator of the RNA-dependent protein kinase (PKR), is up-regulated during stress and activation of PKR signaling pathway leads to apoptosis. We hypothesized that the up-regulation of RAX is involved in the apoptosis of retinal neurons of diabetic rats. Recently, it has been demonstrated that microRNAs play a pivotal role in regulation of gene expression and our computational analysis predicted that RAX is regulated by *miR-29b*. Here, we investigate the expression of RAX and *miR-29b* and their cellular localization in retina of diabetic rats. Retinas were obtained from normal and streptozotocin-induced diabetic rats (45mg/kg bogy weight). We found that *miR-29b* expression evaluated by real time RT-PCR was up-regulated (>3-fold) at 28 and 35 days after injection of streptozotocin. We also observed that the expression of RAX monitored by Western blot was down-regulated at 28 and 35 days which is consistent with the prediction that RAX mRNA is a target of *miR-29b*. The analysis by *in situ* hybridization showed that *miR-29b* is highly expressed in ganglionar neurons of retina of diabetic rats. Interestingly, RAX assessed by immunofluorescence displays the same cellular localization of *miR-29b*. We also found that RAX was up-regulated at 6, 15 and 22 days in retinal ganglionar neurons of diabetic rats which could activate the pro-apoptotic PKR signaling pathway. These findings are relevant since apoptosis of ganglionar neurons is observed in diabetic retinopathy. Our data suggest that RAX is negatively regulated by *miR-29b* which may contribute to develop a new strategy for the treatment of diabetic retinopathy by intravitreal injection of *miR-29b*.

No conflict of interest

D-0671

Incidence of diabetic retinopathy amongst type 2 diabetic patients in a Tertiary Care Hospital in Bangladesh

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Background and aims: Diabetic retinopathy (DR) refers to damage of blood vessels in the retina, is one of the most common micro vascular complications of diabetes. DR may affect up to 80% of all patients who have had diabetes for 10 years or more but can potentially be prevented. Considering the projected exponential rise of diabetes in South Asian subjects by 2030, the significance of the DR for the identification and prevention is of paramount importance. The aim of the present study was to investigate the 5, 10 and 15 years of incidence rate of diabetic retinopathy in Bangladeshi type 2 diabetic patients.
Materials and methods: A random sample of 977 newly diagnosed type 2 diabetic subjects were recruited and followed since 1993 to 2008. The subjects were attending the out patient department, BIRDEM. Diabetic Retinopathy was graded using the Early Treatment Diabetic Retinopathy Study. All patients were examined by an ophthalmologist and were reconfirmed by a senior ophthalmologist.
Results: Of the 977 subjects investigated, 468 were male and 509 were female (mean±SD, age 56±8 years). The incidence rates of DR and (95% CI) were 23.54 (19.61-28.26), 17.52 (14.93-20.55) and 21.47 (18.86-24.44) per 1000 person-years at 5, 10 and 15 years respectively. Incidence of DR increased with increasing age, but this was more prominent in female subjects. Non Proliferative DR (NPDR) was found in 115 patients (11.8%) at 5 years, while this was 13,9% at 10 years and 11,4% at 15 years of follow-ups. Severity of DR increased with the duration of diabetes. Most of the moderate to severe NPDR cases were identified at 15 years control.
Conclusions: Higher rate of DR and NPDR were observed in this population. The severity of the condition intensified with the duration of diabetes. Therefore, necessary strategies are needed to cope with the increasing challenge of diabetes epidemics in Asian subjects. Allowing for avoiding a life long entrenched condition of blindness, prevention in the first place is only likely measure to be successful, for which improved coordination between physician and ophthalmologist are needed along with necessary policy developments.

No conflict of interest

D-0672

Diabetic retinopathy: associated risk factors and prevalence in a diabetic population at Yaounde Central Hospital

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Objective: Available data suggest that application of management of diabetes as recommended by United Kingdom Prospective Diabetes Study and Diabetes Control and Complications Trial Research Group reduces the onset of chronic complications such as diabetic retinopathy (DR). Our objective was to study the prevalence and associated risk factors of DR in diabetic patients in Cameroon, following the recommendations of UKPDS and DCCT.
Method: We carried out a descriptive and analytical study on 186 consecutive diabetic patients aged 7 to 79 with respectively 11 type 1 diabetic patients and 175 type 2 diabetic patients. We carried out a fasting blood sugar test, followed by a post prandial glycaemia after a meal of an energetic value of 300 calories. A clinical examination was then done during which anthropometric parameters were collected. An examination of their feet was done in search of neuropathies using tuning fork and monofilament test. An electrocardiogram was done at rest in search of electrical signs of myocardial ischemia. On the blood and urine samples taken during fasting, we proceeded by measuring the levels of glycated hemoglobin, total cholesterol, HDL cholesterol, triglycerides, plasmatic creatinine, uricemia and urinary level of albumin. We determined the LDL cholesterol and calculated the creatinine clearance according to Cockcroft and Gault and we carried out digital retinographies whereby the films were interpreted by 2 ophthalmologists.
Results: We got a prevalence of DR of 23.7% with respectively 21% for patients with non proliferative DR (NPDR) and 2.7% for patients with proliferative DR (PDR). The average duration of evolution of diabetes was 12(1-24) years for patients with NPDR and 15(7-20) for those with PDR. Those without DR had diabetes which had evolved since 6(1-24) years (P<0.01). Glycated hemoglobin showed a value of 9.9±2.6% for patients with NPDR and 9.2±3.1% for those with PDR. Those without DR had a glycated hemoglobin of 7.7±2.3% (ANOVA F=12.0; P<0.01). Concerning the association with cardiovascular risk factors, the systolic blood pressure was 150±23mmHg and 167±26mmHg in patients with NPDR and PDR respectively. For those without DR it was 139±25mmHg (P<0.01). Diastolic blood pressure was 87±12mmHg and 93±21mmHg in patients with NPDR and PDR respectively. For those without DR it was 82±12mmHg that's a difference of 5mmHg. LDL cholesterol had a value of 1.34±0.66g/l in patients with NPDR and 92±53g/l in those with PDR (P=0.02). We found also a relationship between chronic renal disease and DR (P=0.01).
Conclusion: African subjects don't develop chronic complications of diabetes faster than Caucasian subject if their management applies recommendations of UKPDS and DCCT studies.

No conflict of interest

Complications - macrovascular 2

D-0673

Effect of glycaemia levels on mortality rate in patients with type 2 diabetes and prior myocardial infarction

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Aim: It is now abundantly clear that effective control of blood glucose, as well as control of hypertension and dyslipidemia, is associated with significant benefits for development of vascular complications in type 2 diabetes (T2DM). The aim of the present work was to reveal correlation between glycemia levels and mortality rate in patients (pts) with T2DM and prior myocardial infarction (MI).
Materials: Totally, 131 T2DM pts with prior MI were enrolled in the study (mean age-57.2±3.1 yrs.; diabetes duration-6.5±2.8 yrs). Pts were supervised for 6 months. According to their glycemia control pts were divided into 2 groups (Gr.): Gr.1(study group) – n=72, pts performing home-blood glucose monitoring (five-point profiles, 3 profile days per week). In 53 of these pts oral hypoglycemic agents (OHAs) were administered, and 19 pts were treated with insulins and OHAs. Gr.2 (control groups) –n=59, blood glucose was controlled scarcely (2-3 times per month); 49 pts were treated with OHAs and 10 pts with insulin and OHAs.
Results: Data at entry revealed that glycemia and HbA1c levels were practically identical in both groups: HbA_{1c} (Gr.1 – 7.9±0.4%; Gr.2 –8.1±0.6%, P=0.024), fasting glycemia (FG) – (Gr.1 - 140.5±39.15mg/dl; Gr.2 – 139.3±36.1mg/dl, P=0.857), postprandial glycemia (PG) – (Gr.1 - 162.5±32.43mg/dl; Gr.2 – 169.1±28.6mg/dl, P=0.197) There was no statistically evident difference between the groups. Repeated examination at month 6 revealed: HbA_{1c} (Gr.1 – 6.0± 0.3%; Gr.2 –7.5± 0.7%, P= 0.000), FG – (Gr.1 - 101.5±39.15mg/dl; Gr.2 – 131.1±17.8mg/dl, P=0.000), PG – (Gr.1 -124.7±20.8mg/dl; Gr.2 – 158.1±28.6mg/dl, P= 0.000). Totally, during the 6-month follow-up period five Gr.1. (6.9%) patients died, all of them having repeated MI. In Gr.2 - 7 out of 10 death (16.9%) were caused by repeated MI.
Conclusion: T2DM patients with prior MI, having postprandial glycemia <130 mg/dl showed lower mortality rate (6.9%), than those with postprandial glycemia > 150 mg/dl (mortality rate -16.9%). According to our data 30 mg/dl decrease in fasting glycemia, 30-40 mg/dl decrease in postprandial glycemia and 1.5% drop in HbA1c levels result in 10% decline in mortality rates in these patients.

No conflict of interest

D-0674

The CREDIT Study (Cardiovascular Risk Evaluation in People with Type 2 Diabetes on Insulin Therapy): French baseline data

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Objective: This 4-year non-interventional study aims at observing cardiovascular risk factors (CVRF) and events (CVE) among type 2 diabetic patients (T2D) treated with insulin in a real-life clinical setting.
Methods: GPs and diabetologists enrolled T2D patients who had been recently initiated on insulin therapy. Baseline HbA1c was obtained as the most recent value within 1 year before and 1 month after insulin initiation and divided into 3 categories: <8.5%, [8.5-10.1%] and >10.1%.
Results:
***Population*:** 88 French centers included 432 patients between December 2006 and April 2008. 426 patients (98.6%) were considered eligible (50.5% female). At the time of insulin initiation, mean age (±SD) was 63.3±11.7 years (43.9% being >65 years) and diabetes duration 12.6±9.4 years (>10 years for 50.1% of the subjects). Mean BMI was 30.3±6.3 kg/m^2 (46.6% being > 30 kg/m^2). The prevalence of CVRF was respectively: high blood pressure: 68.5%, family history of premature CVE: 15.5%, current smoker 11.1%. The mean HbA1c was 9.1±1.8%, (> 8% for 77.4% patients).
Microvascular and macrovascular complications were present in roughly 2/3 and 1/3 of the patients respectively, and also present in patients with HbA1c <8.5%:

Prevalence of complications at baseline	HbA1c <8.5% N=161 (39%)	8.5-10.1% N=143 (35%)	HbA1c > 10.1% N= 108 (26%)
Microvascular			
1 or more	67.7%	73.9%	63.6%
Nephropathy	53.5%	53.5%	48.6%
Renal failure	35.4%	28.0%	29.9%
Retinopathy	9.4%	17.5%	14.8%,
Peripheral neuropathy	16.8%	16.8%	24.3%
Macrovascular			
1 or more	28.6%	32.2%	25.5%
Myocardial infarction	12.4%	7.0%	3.8%
Heart failure	4.3%	4.9%	5.7%
Myocardial revascularization	11.2%	11.9%	9.4%
Stroke	1.9%	2.1%	0.9%
Peripheral vascular disease	11.2%	11.9%	9.4%

In a real life setting, insulin was initiated with basal insulin alone, or [+ prandial], for 80.1% [4.3%], 84.6% [4.2%] and 71.3% [10.2%] of the patients in the 3 HbA1c categories respectively. The daily dose of basal insulin was respectively 13.0±6.3, 14.2±7.8, 16.6±9.1 UI. Nearly all patients (97.6%) had only 1 injection daily either at breakfast (22.2%), lunch (2.1%), dinner (35.3%) or bedtime (40.4%). When prandial insulin was combined with basal insulin, 44% of patients had 2 injections of rapid insulin and 52% 3 injections. Premix insulin was used in 10.8%, prandial insulin alone in 1% and another regimen in 3.3% of patients. The daily insulin dose used in subjects on premix was 30.1±20.6 UI divided in 1 (39.1%), 2 (56.5%) or 3 (4.3%) injections. Basal + prandial insulins or premix regimen were initiated among patients with the highest HbA1c levels.
Conclusion: In this population, insulin was initiated, in a real life setting, in T2D patients with a long history of diabetes and high levels of HbA1c. A high prevalence of micro and/or macrovascular complications was present across all HbA1c levels.

Conflict of interest:
Advisory board: S. Picard, M. Marre
Commercially-sponsored research: S. Picard, A Bekherraz, M. Marre

D-0675

Predictors of mortality in patients with type 2 diabetes mellitus

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Aims: To assess mortality and factors related with it, in patients with type 2 diabetes.
Methods: We followed 1211 consecutive patients who were examined for the first time at the outpatient clinic between 1996 and 2002. In 1001 of them, 5-year data was available, while 210 could not be reached, however comparison for 15 baseline anthropometrical and biochemical parameters between the groups showed no difference, thus the sample studied is considered representative of the total. Mortality and causes of death were recorded from patient records or from close relatives. Baseline parameters were compared after appropriate adjustments between the groups of the deceased (n=100) and the group of the survivors (n=901).
Results: The group of the deceased compared to the survivors had older age, 65.2 vs 55.3, p<0.001, greater duration of diabetes, 11.9 vs 8.0 years, p<0.001, higher systolic blood pressure, 141.8 vs 136.7 mmHg, p<0.05, higher serum creatinine, 1.2 vs 1.1 mg%, p<0.01, lower GFR, 66.1 vs 72.2 ml/min, p<0.05, higher albumin concentration in the urine, 50.5 vs 28.9 mg/L, p<0.01 and higher serum urea 48.8 vs 36.8 mg%, p<0.001. HbA1c, total, HDL, LDL and non-HDL cholesterol as well as triglyceride levels did not differ between the two groups. The indices of total or abdominal obesity did not also differ between the two groups. The prevalence of cardiovascular disease (myocardial infarction, coronary by-pass surgery, PTCA, stroke or abnormal ECG indicative of coronary heart disease according to the Minnesota Code) was higher in the group of the deceased compared to the survivors, 49.0 vs 27.0%, p<0.001.
Discussion: In diabetic patients cross-sectional assessment of the glycemic control and lipid profile have no predictive value for mortality. On the other hand, renal function indices and the presence of cardiovascular disease are strongly related with mortality.

No conflict of interest

D-0676

Screening strategy for asymptomatic coronary heart disease in Japanese patients with diabetes mellitus

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Background and aim: It has been considered that Japanese patients with diabetes are less frequently associated with cardiovascular disease (CVD) than Caucasians, but they have recently been indicated to be complicated with CVD, especially coronary heart disease (CHD). However, screening strategy to detect asymptomatic CHD in diabetes mellitus is not established, yet, in Japan. We investigated effectiveness of our screening strategy for asymptomatic CHD during the past five years.

Subjects and methods: The study included a total of 1180 Japanese patients with diabetes who were admitted to our hospital during five years. Among them, all subjects without previous history of CHD or any symptom suggesting CHD were checked with electrocardiography (ECG) at rest. Treadmill tolerance test (TTT) was performed in all patients unless they have any contraindication for TTT. The patients with abnormal TTT findings were further examined with thallium 201 cardiac scanning (TCS), and the subjects with abnormal TCS findings were examined with coronary angiography (CAG) in order to make a final diagnosis of CHD.

Results: Among 1180 patients, a total of asymptomatic 418 subjects were checked with both ECG at rest and TTT, of whom, a total of 60 subjects had positive TTT, and 53 patients of them received TCS. Among those 53 patients, 22 (41.5%; 1.9% of total patients with diabetes) had positive TCS. There were no significant differences of basal clinical parameters between the TCS-positive group and negative group, except for female dominance in the negative group. Among TCS-positive patients, 17 subjects received CAG, and 11 subjects (64.7%) were finally indicated to have CHD; three cases received percutaneous coronary intervention (PCI), two cases received coronary artery bypass surgery (CABG), and two cases of the remaining six cases received PCI and CABG, respectively, after one-year follow-up with medication.

Conclusion: As a screening strategy for asymptomatic CHD in Japanese patients with diabetes, it seems rational to use TTT, TCS and finally CAG.

No conflict of interest

D-0677

People with diabetes in France: a 3.95% prevalence rate in 2007 and a 32% hospitalisation rate

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Aims: To update data on treated diabetes prevalence and to compare age and gender-adjusted hospitalization rates and their motives between people with or without treated diabetes

Methods: Study conducted using claims data on the 56.5 million people insured by the general healthcare scheme (84% of the population). Our database contains individualized, anonymous and exhaustive data on all healthcare consumption covered by national insurance: GP and specialist consultations and visits, all drugs dispensed with their ATC, diagnostic procedures, medical devices. Our data also includes individual level information on hospital diagnostics (ICD codes), technical and surgical procedures, length of stay and the patient's French DRG. People with claims for at least 3 deliveries of oral hypoglycaemic agents (OHA) or insulin in 2007 were considered as diabetics (2,062,092 individuals).Comparisons between diabetic and non-diabetic individuals were adjusted for age and gender.

Results: In 2007, the prevalence rate of people treated for diabetes was 3.95%. (mean age 64.8 years (SD 13.8). Prevalence rates by age group indicated huge differences: 0-44 years old: 0.4%; 45-64 years old: 5.8%; 65-74 years old: 13.3%; 75 years and older: 13.4%. Overall prevalence was higher for men (4.7 %) than for women (3,3 %). In 2007, 31.9% of people treated for diabetes were hospitalized (13.0% had a stay under 24hours and 24.1% had a stay above 24 hours). The annual hospitalization rate was higher for under 20 years-olds (54%) and for over 80 years-olds (42%). After adjustments, people treated for diabetes were more often hospitalized [Relative Risk = 1.57 (1,56-1,59)] than those without diabetes and more specifically for cataract [2.58% annual hospitalization rate, RR = 1.46 (1.41-1.53)], stroke [0.63%, RR = 1.64 (1.50-1.80)], myocardial infarction [0.32%, RR = 2.3 (2.0-2.,6)], amputation [0.16%, RR = 6.1], kidney transplantation [0.02%, RR = 4.9]. Dialysis sessions (553 823) concerned 0.29% of diabetics [RR = 3.1 (2.6-3.6)]. For chemotherapy and / or radiotherapy (1.02%) and major orthopedic surgery (1.12%), there was no significant difference between diabetics and patients without diabetes. Hospitalization was less frequent for digestive endoscopy amongst diabetics [3.38%, RR = 0.88 (0.86-0.91)].

Conclusion: As in other countries, the diabetes epidemic is still expanding rapidly in France, at rates above what experts had predicted. The high prevalence in individuals aged over 60 years and the increasing number of geographic disparities have to be taken into account in public health policies. A better knowledge of the links between healthcare spending and hospitalisation rates may contribute to a better follow-up of complications likely to lead to hospitalisations of persons treated for diabetes.

No conflict of interest

D-0678

Predicting microvascular complications in people with type 2 diabetes: utility of estimated global cardiovascular risk

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Background and purpose: Chronic complications are associated with increased morbidity and mortality in people with diabetes. Effective treatments for preventing or slowing their progression are well known. In resource-poor settings however, reliable methods are needed to select those more likely to benefit from such treatment or further investigations. The aim of this study was to assess the performance of two global cardiovascular risk equations in predicting the presence of diabetic microvascular complications, in a Cameroonian type 2 diabetic population.

Methods: The study population included 213 (41% women) individuals with diabetes, aged 32 to 78 years, consecutively recruited at the National Obesity Center (Yaounde-Cameroon), between August and December 2008. Anamnestic, clinical and paraclinical data were used to assess the presence of the following complications: any peripheral neuropathy, any diabetic retinopathy and any nephropathy. The projected 10-year absolute coronary risk was estimated with the UKPDS coronary risk engine and one recent Framingham risk equation. Discrimination and calibration of these equations to predict the presence of microvascular complication were evaluated using the Area Under the Curve (AUC) and the Hosmer & Lemeshow khi square test respectively. Data analysis used the computer software SPSS® 12.0, and the p-value < 0.05 was considered significant.

Results: The distribution of microvascular complications was as follows: at least one complication (61%), retinopathy (25%), nephropathy (11%), and neuropathy (54%). The median (25-75th percentile) of absolute cardiovascular risk was 18.3% [8.1-26.4] with the Framingham's equation, and 17.7 [6.2-24.3] with UKPDS coronary risk's equation. The two equations had a statistically significant discrimination for diabetic retinopathy with an AUC (95% confidence interval) of 0.593 (0.504-0.682) for Framingham's equation, and 0.603 (0.518-0.688) for the UKPDS one. Both equations had no significant discrimination to detect neuropathy and nephropathy. The calibration of the two equations was good, with a good agreement within deciles of calculated risk, between the estimated retinopathy prevalence using equations and the observed prevalence within the population. However, the prevalence within lower deciles was not appreciably different to the one within upper deciles.

Conclusions: The UKPDS and Framingham's coronary risk equations have a low or no discriminative power for screening microvascular complications of diabetes. Therefore, these models may not be appropriate for the selection of patients for costly diagnostic investigations for microvascular complications. Cohort data are needed to develop reliable screening tools for our population.

No conflict of interest

D-0679

Comparing the power of metabolic syndrome and type 2 diabetes for discrimination of those who develop cardiovascular outcomes: results from a 7.5-year population based cohort study in Iran

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Aims: To compare the discriminatory power of metabolic syndrome and Type 2 diabetes for developing cardiovascular outcomes in a population based setting.
Methods: A total number of 6547 subjects aged=30 years and free of cardiovascular disease (CVD) at baseline were followed for a median duration of 7.5±1.2 years. The measured outcome was fatal and non-fatal coronary heart disease and stroke. Metabolic syndrome (MS) was defined according to the ATP III and IDF definitions. Type 2 Diabetes (T2DM) was defined as fasting plasma glucose =126 mg/dl and/or 2-hour plasma glucose (standard OGTT) =200 mg/dl and/or taking of anti-diabetic medications. Cox regression was used to calculate the relative risk (RR) of the outcome in different groups. Area under the receiving operating characteristic (ROC) curve (AUC) was used to calculate the discriminatory power of Cox models.
Results: A total number of 396 outcomes were ascertained during the follow-up. The RR (95%CI) of developing CVD in those with MS based on the ATP III and IDF definitions after adjustment for age, sex, smoking and family history of premature CVD were 2.3(1.9-2.9) and 2.1(1.6-2.6) respectively. The Corresponding RR for T2DM compared to normoglycemic subjects was 3.3(2.6-4.2). The AUC (95%CI) of multivariate models that contained the ATP III definition, the IDF definition and T2DM were 0.79(0.77-0.81), 0.78(76-0.80) and 0.80(0.78-0.82) respectively. T2DM had significantly higher discriminatory power than the IDF definition (P=0.006) but had comparable power to that of the ATP III (P=0.2). Addition of either the ATP III or the IDF definition to a model that already contained T2DM did not significantly increase its discriminatory power [AUC of 0.80(0.78-0.82) after addition of either definition].
Conclusion: For prediction of future cardiovascular outcomes, T2DM has comparable discriminatory power to that of the ATP III definition of MS and is superior to the IDF definition in this regard. There seems to be little benefit from adding MS to T2DM if improvement in prediction of cardiovascular outcomes is desired.

No conflict of interest

D-0680

Chronic diseases among teachers in South Africa - should we be concerned?

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Aims: In developing countries, there is a dual burden of both infectious and chronic diseases due in part to the epidemiological transition. Chronic diseases are usually associated with socioeconomic status, lifestyle factors and age. However, in South Africa it is unclear which groups should be targeted for chronic disease prevention as research is limited in this area. The objectives of this study were to: (1) to determine the prevalence of chronic diseases (hypertension, diabetes, heart disease, HIV) among South African teachers; and (2) to examine the association of chronic diseases in regards to health status, hospitalization and frequent mental distress.
Methods: A survey was conducted among South African public school teachers to examine HIV in 2004. In addition to HIV questions, several questions related to chronic diseases such as hypertension, diabetes and heart disease were included. The survey employed cluster sampling in order to be representative of teachers in South Africa. Teachers were selected from districts in all nine provinces. A total of 21,626 teachers were interviewed from 1,766 randomly chosen schools. Data analysis included univariate and bivariate analyses using STATA version 9 that accounted for the complex sample design of the survey.
Results: The prevalence of self-reported diabetes was 4.7%, hypertension 15.9%, heart disease 2.0%, and HIV 12.8%. There were some teachers with both HIV and heart disease (0.3%), diabetes (0.4%) or hypertension (2.0%). Overall, the majority of teachers (69.8%) had no chronic disease, 26.0% had one, 3.7% had two and 0.5% had three. The prevalence of chronic diseases differed by socio-demographic variables. Teachers with two or more chronic diseases when compared to those with no chronic diseases were more likely to have been hospitalized in the past 12 months (unadjusted odds ratio {UA OR} = 2.79, [2.24-3.48]), reported their health status as fair or poor (UAOR = 5.78, [4.79-6.97]) and experienced frequent mental distress (UAOR = 1.56 [1.05-2.31]). Similar results were observed for teachers with only 1 chronic disease when compared to those with none.
Conclusions: In South Africa, teachers are a group to target for chronic disease treatment and prevention. Quality of life may also be affected as teachers with chronic diseases did not view their health status favorably and were more likely to have frequent mental distress, a proxy for depression.

No conflict of interest

D-0681

Diabetes and vascular complications in Botswana

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Introduction: The role of diabetes as a cardiovascular risk factor in populations undergoing rapid epidemiological transition remains unclear. In the West, macrovascular complications (MAC) are the leading causes of morbidity and mortality whereas in Sub-Saharan Africa, microvascular complications (MIC) dominate. There are no data on the prevalence of vascular complications of diabetes in Botswana, a middle-income country in Southern Africa. It was hypothesized that MAC would be the major vascular disease in adult diabetics in Botswana.
Objectives: To determine the prevalence of MAC and MIC in diabetics aged 20-74 yrs at a tertiary hospital in Gaborone, Botswana.
Methods: Setting: Diabetes Clinic, Princess Marina Hospital. Participants were recruited through systematic sampling based on a finite population of 500 diabetics with 95% confidence interval and 80% power. Each diabetic was evaluated for CVD risk factors; coronary heart disease (CHD), cerebrovascular disease (CBVD) and peripheral arterial disease (PAD); diabetic retinopathy, neuropathy and nephropathy. Statistical significance ($p<0.05$) was estimated using Chi square tests or Fisher's exact test with 2-tailed p-value.
Results: Of the 258 diabetics, mean age 50.2 ± 10.8 yrs enrolled into the study, the majority were females (55.4%), Batswana (89.9%), married and employed, with secondary or tertiary education. Diabetes was diagnosed after the age of 30 years in 90% of patients; mean duration of known diabetes 6.2 ± 6.0 years; 53.1% were diagnosed >5 years before enrolment. MAC singly or in combinations affected 25% of diabetics with PAD in 19%, CBVD in 5.4% and CHD in 4.3%. Two-thirds of patients with CBVD suffered thrombotic stroke; 28.6% had amaurosis fugax and one patient had transient ischaemic attack. The major risk factors for CHD were age >55 years, duration of diabetes >10 years and elevated LDL-cholesterol; while age >60 years and blood pressure >160/>85 mm Hg were strongly associated with CBVD. Tobacco, age >50 years and systolic blood pressure >140 mm Hg predisposed to PAD. MIC was twice (46.8 %) more common than MAC (peripheral neuropathy 30%, retinopathy 20%, nephropathy 7.8%). The odds risk of MAC in a diabetic with impaired pin prick sensation was 2.30 (95% CI 1.26-4.13; p=0.005). Absent ankle jerk was strongly associated with PAD (OR 2.61; 95% CI 1.22-5.62; p=0.01).
Conclusions: Contrary to the hypothesis, MIC was more prevalent than MAC in Botswana despite high prevalence of CVD risk factors. Three risk factors (hypertension, advanced age and longer duration of diabetes) were strongly associated with both MAC and MIC. Unprecedented opportunities exist for primary prevention of MAC in Botswana.

No conflict of interest

Complications - macrovascular 3

D-0682

Ambulatory blood pressure monitoring, arterial stiffness index and erythrocyte electron transfer in type 1 diabetes families

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Aims: Oxidative damage is increased in type 1 diabetes (T1D) families and normotensive non-diabetic relatives of T1D subjects have an abnormal blood pressure response to exercise testing that is associated with indices of metabolic syndrome and oxidative damage. We evaluated the pattern of 24-h ambulatory

blood pressure monitoring (ABPM) and ambulatory arterial stiffness index (AASI) in T1D families in relation with clinical parameters, autonomic function and oxidative biomarkers.

Methods: A cross-sectional study was conducted in 25 control subjects (46±12 y), 20 T1D patients (46±10) and 20 siblings (45±10) using an oscillometric device (Takeda TM2430). In addition to routine laboratory investigations and clinical testing of autonomic function, we measured the rate of oxidant-induced erythrocyte electron transfer to extracellular ferricyanide (RBC vfcy). This redox system supplies electrons (from intracellular electron donors) to reduce extracellular oxidants.

Results: Systolic BP (SBP) MESOR and pulse pressure (PP) were higher in T1D subjects and correlated positively with the duration of diabetes. Their siblings were insulin resistant (lower HOMA-IS than controls) and had larger SBP amplitude than controls; daytime SBP was positively associated with BMI and RBC vfcy. AASI was higher in members of T1D families. It was significantly associated with expiration/inspiration ratio at deep breathing and disease duration in T1D patients, whereas with fasting plasma glucose among non-diabetic people.

Conclusion: Siblings of T1D probands show signs of insulin resistance, larger circadian SBP amplitude and higher AASI. Circadian SBP amplitude was significantly associated with RBC vfcy, thus confirming the role of transplasma membrane electron transport systems in vascular pathobiology. Increased arterial stiffness in siblings was partially explained by plasma glycaemia.

No conflict of interest

D-0683

Endothelial cells isolated from newborns with a family history of type 2 diabetes mellitus show reduced synthesis of NO and ROS, and diminished metabolic and cellular activity

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The efficacy of endothelial cell metabolism is currently evaluated by its adequate function. The increased risk to develop early cardiovascular damage in individuals with a family history of type 2 diabetes mellitus (FH-DM2) has been associated with an inadequate endothelial function. In this work, we evaluated glucose uptake, lactate synthesis, cell proliferation, mitochondrial activity, as well as the synthesis of nitric oxide (NO) and reactive oxygen species (ROS), in Human Umbilical Vein Endothelial Cells (HUVECs) obtained from healthy newborns with and without a FH-DM2. Cell cultures were incubated with supraphysiological glucose concentrations (15 or 30 mmol/L) before adding or not CCCP, a mitochondrial uncoupler, cytochalasin B (inhibitor of glucose transport), thiamine pyrophosphate (PPT, coenzyme of the pyruvate dehydrogenase complex) and DPI (inhibitor of NADPH-oxidase). eNOS and GLUT1 transcripts were determined by RT-PCR. Results obtained after 24 or 48 hours of cell culture showed an increase in glucose uptake, lactate synthesis, cell proliferation and mitochondrial activity in control HUVECs in comparison with FH-DM2 HUVECs. PPT diminished the uptake of glucose in control HUVECs, while FH-DM2 HUVECs didn´t show significant changes. We also found two different cell populations in control HUVECs, but only one of them was important for NO and ROS synthesis. In contrast, only one cell population which showed a reduced synthesis of NO and ROS ($P<0.05$) was observed in FH-DM2 HUVECs. Control HUVECs showed a significant inhibition of ROS synthesis in the presence of CCCP, DPI or cytochalasin B. We also found diminished expression of eNOS transcripts, and enhanced expression of GLUT1 transcripts in FH-DM2 HUVECs vs control HUVECs ($P<0.05$).

Conclusions: our results support the presence of relevant metabolic differences in HUVECs with and without FH-DM2; they also suggest that mitochondria and NAD(P)H-oxidase from FH-DM2 HUVECs have an impaired response in the presence of high glucose concentrations. The inadequate mitochondrial activity of FH-DM2 HUVECs is probably associated with an impaired synthesis of NO. This inherent deficient energy metabolism might be the cause of the early endothelial dysfunction observed in individuals with a strong FH-DM2.

No conflict of interest

D-0684

Immediate and long-term clinical outcome after spinal cord stimulation for refractory angina pectoris in diabetics and non-diabetics

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Introduction: Neuromodulation (Spinal Cord Stimulation, SCS) has become an established therapeutic alternative for patients with therapy-refractory angina pectoris not suitable for percutaneous or surgical revascularisation. In Germany this therapy has encountered considerably less acceptance to date than in other countries (e.g. Sweden and Italy). How effective is neuromodulation in patients with diabetes mellitus?

We compared the medium and long-term clinical improvements in diabetics to non-diabetics, as well as the reduction in hospitalization rates.

Methods: Since January 2001, we performed SCS in 141 patients (pts.) (103 men, 38 women, age 65±8 years, bmi 27±9 kg/qm). 29 percent had known type 2 diabetes mellitus. All pts. had severe angina pectoris (III to IV [79/62] according to Canadian Cardiovascular Society [CCS]) under considered medication due to angiographically documented end-stage coronary artery disease (CAD), which could not be treated interventionally (mean intervention: CABG 1.3±0.8, PCI 1.4±1.3).

Results: We have analysed 20 pts. with known diabetes and compared the results to 20 matched non-diabetics. In the 1-24-month follow-up angina pectoris and nitrate consumption could be significantly reduced. With SCS, the amount of time spent in hospital due to angina pectoris or other complaints associated with coronary artery disease was significantly reduced (diabetics compared to non diabetics): 28±19 / 26±17 days within 12 months before SCS to 1±2 / 2±3 days after SCS; medical consultations from 11±6 / 12±7 days before to 6±3 / 7±3 days after.

SCS in diabetics	before (n=20)	after 12 months (n=20)	after 24 months (n=17)
angina (class/es)	III/13, IV/7	0/9, I/3, II/6, III/2	0/8, I/4, II/3, III/2
nitrates (per week/s)	> 7/15, 3-7/3,>3/2	>7/0, 3-7/3, <3/4, 0/12	>7/0, 3-7/2, <3/4, 0/11
SCS in non diabetics	**before (n=20)**	**after 12 months (n=20)**	**after 24 months (n=18)**
angina (class/es)	III/12, IV/8	0/10, I/5, II/3, III/2	0/9, I/4, II/4, III/1
nitrates (per week/s)	> 7/14, 3-7/3,>3/3	>7/0, 3-7/2, <3/5, 0/13	>7/0, 3-7/2, <3/5, 0/11

Conclusion: Neuromudolation is a safe and effective symptomatic treatment for therapy-refractory angina pectoris in conjunction with end-stage coronary artery disease in diabetic and non diabetic patients.

Nitrate consumption and in-patient time spent in hospital can both be significantly reduced.

SCS leads to a significant reduction in therapy costs.

No conflict of interest

D-0685

Cross-sectional association of lung function with insulin resistance and metabolic disorders in Japanese subjects

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Background: Recently, it has been reported that lung dysfunction, as measured by declined forced vital capacity (FVC) or forced expiratory volume in one second (FEV1), is independently associated with cardiovascular events, insulin resistance (IR) and diabetes (DM). These associations are partly explained by lung-related inflammatory mediators and their effects on insulin signaling, and by adverse early life exposures, which affect lung growth and development. However, very few studies have analyzed the relation between

lung function with IR and metabolic disorders in Japan. The aim of our study is to examine whether lung dysfunction is independently associated with IR and several metabolic disorders in Japanese.

Subjects and methods: Subjects included 2,048 men and 1,065 women who did not have previous DM, cancer, endocrine, respiratory or congestive heart disease, and were not under pharmacological treatment for hypertension or dyslipidemia in a general health examination. FVC and FEV1 were measured by spirometer. Before analysis, crude data on FVC and FEV1 were divided by predicted FVC and FEV1, respectively, to yield FVC (% predicted) and FEV1 (% predicted). Smoking status and physical activity were assessed by questionnaires. The homeostasis model assessment (HOMA) was calculated as: fasting immunoreactive insulin (F-IRI)(μU/ml) x fasting plasma glucose (FPG)(mmol/l) / 22.5 among those with FPG < 6.10 mmol/l. IR was defined as the highest quartile of F-IRI or HOMA in subjects with FPG < 6.10 mmol/l. Multivariate linear regression models were used to evaluate whether FVC or FEV1 is independently associated with metabolic variables, F-IRI and HOMA.

Results: FVC % predicted and FEV1 % predicted were significantly correlated with baseline values for age, BMI, waist circumference (Wc), HbA1c, triglyceride (TG), HDL-C, blood pressure (BP), F-IRI and HOMA. The multiple linear regression analysis showed that FVC % predicted was significantly associated with FPG (ß= -0.032, p=0.025), HbA1c (ß= -0.002, p<0.000), TG (ß= -0.237, p=0.007), systolic BP (SBP)(ß= -0.049, p=0.013), HDL-C (ß=0.066, p<0.000), F-IRI (ß= -0.031, p<0.000) and HOMA (ß= -0.008, p<0.000) after adjusting for age, sex, BMI, Wc, pack-years of cigarette and physical activity. Further additional analysis adjusting for F-IRI showed that these relations were not changed in HbA1c and HDL-C. FEV1 % predicted was also associated with HbA1c (ß= -0.002, p<0.000), SBP (ß= -0.059, p=0.004), HDL-C (ß=0.094, p<0.000), F-IRI (ß= -0.024, p<0.000) and HOMA (ß= -0.006, p<0.000) after adjusting for those confounders. These associations were not changed in HbA1c, SBP and HDL-C, even after additional adjusting for F-IRI.

Conclusion: Decline in FVC and FEV1 were related with a deterioration of BP and lipids and glucose metabolism, independently of IR. This may suggest that hypoxia and inflammation induced by lung dysfunction cause multiple metabolic disorders with or without mediation by IR.

No conflict of interest

D-0686

Albuminuria levels are independently associated with peripheral arterial disease in type 2 diabetes without advanced chronic kidney disease

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Aims: Chronic kidney disease (CKD) is associated with the elevated risk of cardiovascular disease (CVD). Also, the presence of microalbuminuria in type 2 diabetes is known as a risk factor for CVD. The ankle-brachial index (ABI) has been used to assess peripheral arterial disease (PAD). We evaluated the associations of markers for renal impairment with ABI in type 2 diabetic patients without advanced CKD.

Methods: We enrolled 284 type 2 diabetic patients (mean age 57.8±9.8 years; body mass index (BMI) 25.2±3.2 kg/m^2; male 57.4%; diabetes duration 6.5±6.1 years; HbA1C 7.8±2.1%). Patients with serum creatinine (Cr)>1.4 mg/dl and estimated glomerular filtration rate (eGFR)<60 ml/min per 1.73 m^2 were excluded. Clinical and biochemical metabolic parameters were measured. Markers of renal impairment including serum Cr, serum cystatin C (CC), 24 hour (h) urine albumin (Alb), and eGFR were measured. PAD was diagnosed based on an ABI<0.9.

Results: Patients with PAD were 7.4%. Patients with microalbuminuria and macroalbuminuria were 26.1% and 6.3%, respectively. According to the severity of albuminuria, systolic blood pressure (BP), diabetes duration, fasting blood glucose, and HbA1C levels were significantly increased, but ABI was decreased (p<0.05). Patients with macroalbuminuria had higher CC and uric acid levels than those without albuminuria. Age, smoking, hypertension, 24 h urine Alb, Cr, CC levels were positively correlated with the presence of PAD, but diastolic BP was negatively correlated (p<0.05). In multivariate regression analysis, 24 h urine Alb, smoking, and diastolic BP were significantly associated with the presence of PAD. The odds ratio (OR) for the presence of PAD according to the severity of albuminuria was significantly increased in patients with macroalbuminuria after adjustment for age, sex, diastolic BP, and smoking [OR (95% CI); 5.30 (1.15-24.35)].

Conclusion: Our finding suggested that 24 h urine Alb levels were independently associated with PAD in type 2 diabetes without advanced CKD.

No conflict of interest

D-0687

Postprandial endothelial dysfunction in prediabetic first degree relatives of patients with type 2 diabetes mellitus

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Aim: To compare postprandial endothelial dysfunction after oral fat challenge in prediabetic (IGT±IFG) subjects and healthy individuals with normal glucose tolerance (NGT), and to evaluate the role of familial predisposition on postprandial endothelial dysfunction in them.

Methods: Oral Glucose tolerance tests (OGTT) were performed in 39 apparently healthy, obese individuals without previous history of Diabetes Mellitus. Study subjects were divided on the basis of family history of type 2 Diabetes(T2DM) and OGTT results using standard WHO criteria into three groups – prediabetes (IGT±IFG) with positive family history of T2DM, prediabetes (IGT±IFG) with no family history of T2DM, and NGT with no family history of T2DM. Fasting and postprandial lipids were estimated at 0,2,4,6 and 8 hours after the fat meal. Endothelial function was studied in all subjects after 4 hours of standard oral fat challenge by non-invasive brachial flow mediated vasodilation (FMD), and comparisons made between the three study groups.

Results: There was a progressive and highly significant worsening of postprandial FMD endothelial function as we moved from NGT to family history negative prediabetic subjects (p=0.000) to family history positive prediabetic subjects (p=0.000), which showed significant correlation to postprandial plasma glucose (r= -0.598) HOMA IR (r=-0.382) and post prandial serum triglyceride levels at 6 hours (r=-0.323) and 8 hours (r= -0.371) but not to fasting plasma glucose (FPG), glycosylated hemoglobin, other postprandial lipemic parameters (LDL, TC, HDL) and markers of insulin resistance.

Conclusion: Prediabetic subjects, particularly those with familial predisposition to diabetes, respond to oral fat challenge with greater endothelial dysfunction which correlates with postprandial glucose and triglyceride levels and insulin resistance.

No conflict of interest

D-0688

Relationship between left ventricular diastolic dysfunction and insulin resistance in non-diabetic Korean subjects

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Aims: Mild left ventricular diastolic dysfunction is frequently detected in elderly or hypertensive subjects without severe heart disease, and in subjects with impaired fasting glucose or impaired glucose tolerance without cardiovascular disease. Insulin resistance has been suggested to be associated with the left ventricular diastolic dysfunction in IGT or diabetes. The purpose of this study was to examine the relationship between the insulin resistance and left ventricular diastolic dysfunction in non-diabetic subjects.

Methods: Using the health database of 1,826 non-diabetic subjects (1,536 men and 290 women), aged 25 ~ 85 years, in two other medical centers, we evaluated the relationship between left ventricular diastolic dysfunction and HOMA-IR.

Results: The higher quartile of insulin or HOMA-IR, the higher the prevalence of left ventricular diastolic dysfunction and the higher the age-, gender-, and BMI-adjusted OR of the left ventricular diastolic dysfunction were significantly in logistic regression (p < 0.01). The prevalence of left ventricular diastolic dysfunction was increased significantly with increased metabolic score, too (p < 0.01). Gender, and BMI-adjusted ORs for the left ventricular diastolic dysfuction were exponentially increased according to increased age group (p < 0.01). Among the diagnostic components of the metabolic syndrome, obesity of BMI more than 25 kg/m2, and hypertension were associated with the prevalence of left ventricular diastolic dysfunction (OR 1.87, p < 0.01 and OR 1.32, p < 0.05). Among the indices of tissue Doppler imaging, the Ea (peak early diastolic mitral annual velocity) was negatively associated with the HOMA-IR quartile

($p < 0.01$) and showed the more negative linear correlation with HOMA-IR than E/A ratio, E/Ea ratio, DT (deceleration time) after adjustment for age and gender ($r = -0.27$, $p < 0.01$).

***Conclusion*:** Insulin resistance is suggested to be significantly associated with the left ventricular diastolic dysfunction independently of the BMI in non-diabetic Korean subjects without heart disease.

No conflict of interest

D-0689

Acceleration of carotid artery atherosclerosis is associated with impaired glucose metabolism and related changes of adipocytokines: a cross-sectional study in an elderly Chinese population

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Objective:To investigate the relationships among acceleration of carotid artery atherosclerosis, impaired glucose metabolism, metabolic syndrome and related changes of adipocytokines in elderly Chinese population.

Method: A cross-sectional study was carried out in 305 elderly subjects (age, 77.48±7.98 years). Anthropometric parameters, blood pressure, blood lipid profiles, fasting glucose and insulin levels were carefully measured. Serum concentrations of tumor necrosis factor (TNFa), interleukin-6 (IL-6), adiponectin, and leptin were measured by ELISA method. OGTT were applied in all subjects without established diabetes mellitus. The diagnoses of NGT, IGT, T2DM were based on WHO criteria, and metabolic syndrome(MS) were based on NCEP ATPIII criteria. Subjects were divided into four groups according to different glucose tolerance and presence or absence of metabolic syndrome. Ultrasonography was used to measure intima-media thickness (IMT) and plaques in carotid arteries.

Results: Compared with NGT group, IGT group had significantly higher levels of waist WC, TG, fibrinogen and lower level of HDL-C. T2DM/MS(+)group had the highest level of WC. T2DM/MS(-) and T2DM/MS(+) group had higher levels of fasting glucose, insulin and HbA1C than other two groups. Both IMT and carotid artery plaque scores in IGT group and T2DM with or without MS groups were higher than NGT group. IMT, plaque incidence, and plaque scores were revealed to be higher in IGT and T2DM groups with and without MS, and significantly positively correspondent with TG, and fasting glucose. TNF-a, IL-6, leptin and leptin/adiponectin ratio increased in T2DM/MS(-) and T2DM/MS(+) group. Adiponectin level tended to decrease associated with exacerbation of glucose metabolism and combination metabolic syndrome.

Conclusions: Impaired glucose metabolism is closely associated with acceleration of atherosclerosis, even in the stage of IGT. Changes of adipocytokines may play an important role in this situation. Accumulations of other metabolic disorders defined by MS seemed not to be more important in our studied elderly population.

	NGT	IGT	T2DM/MS(-)	T2DM/ MS(+)
Number	79	46	62	93
Average age	77.42±7.70	78.11±5.89	77.34±7.94	75.86±8.98*
SBP(mmHg)	130.20±14.55	129.89±21.07	132.55±14.79	134.13±20.96
DBP(mmHg)	72.75±9.12	70.74±11.44	72.47±8.24	73.57±10.48
WC(cm)	83.53±7.85	85.15±8.28	84.11±5.99*	90.11±7.89*
TC(mmol/L)	4.13±0.87	4.02±0.84	3.86±0.68	4.08±0.97
TG(mmol/L)	1.14±0.45	1.31±0.52*	1.08±0.37	2.03±1.15*
HDL-C(mmol/L)	1.44±0.36	1.35±0.39	1.39±0.34	1.25±0.39
LDL-C(mmol/L)	2.48±0.78	2.39±0.65	2.25±0.56	2.43±0.88
Fasting Glucose	4.70±0.47	5.11±0.66*	6.62±2.54*^	6.91±2.39*^
HbA1c	5.46±0.42	5.65±0.39	6.75±1.38*^	7.03±1.66*^
CIMT(cm)	0.92±0.19	0.93±0.20*	0.99±0.20*^	0.96±0.19*
Plaque Incidence (%)	67.42	67.21	77.42*	78.49*
Plaque Score	1.75±1.59	1.77±1.07	1.82±1.42*	1.73±1.33
TNFa(pg/ml)	7.11±9.58	8.43±8.47*	10.22±11.96*^	7.17±7.08
IL-6(pg/ml)	6.24±8.78	7.45±9.83*	16.53±20.03*^	7.89±10.62*
Adiponectin(ug/ml)	13.36±8.74	14.21±8.47	11.51±14.01*^	10.59±21.02*^
Leptin (ng/ml)	33.91±32.79	21.62±15.08*	33.88±37.50^	26.80±28.08*^

* P<0.05 compared with NGT group; ^ compared with NGT group

No conflict of interest

Glycaemic control

D-0690

Association of glycaemic exposure with macrovascular and microvascular complications of type 2 diabetes: ADVANCE prospective observational analyses

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Background: The results of recent large-scale trials have raised questions about the benefits of intensive glucose control in patients with type 2 diabetes. We investigated the relationship between glycaemic exposure and the risks of vascular complications and death in a contemporaneous cohort of 11,140 patients with long standing type 2 diabetes included in one of these trials.

Methods: All patients randomised in the ADVANCE trial to receive either intensive or standard glucose control were included in analyses examining risks of all major macrovascular and microvascular complications, all-cause death, cardiovascular death, new or worsening nephropathy, new or worsening retinopathy and hospitalisation. Glycaemic exposure was measured as baseline haemoglobin A1c (HbA1c) or over time as the mean HbA1c of annual measurements during follow up and prior to the first event. Adjusted risks for each 1% increase in HbA1c were estimated using Cox proportional hazards models. Differences in the slope of the association between HbA1c and risks at different HbA1c levels were tested using linear spline models.

Results: There was a positive and independent log-linear relationship between the risk of all major macrovascular or microvascular events and glycaemic exposure when assessed by baseline or mean HbA1c over time. For every 1% lower level in mean HbA1c over time, there was a 22% lower risk of a macrovascular event, 26% lower risk of a microvascular event, 22% lower risk of all-cause death, 25% lower risk of cardiovascular death, 19% lower risk of new or worsening nephropathy, 31% lower risk of new or worsening retinopathy and 15% lower risk of hospitalisation (all $p<0.01$). Within the range of HbA1c studied (about 5.5 -10.5%), there was no evidence of any "threshold" below which lower levels of HbA1c were not associated with lower risks of major microvascular events. However, there was some evidence of a "threshold" effect for risks of major macrovascular events and death at a mean HbA1c level of less than 6.5%.

Conclusions: While the risks of major microvascular events are progressively lower down to HbA1c levels of 5.5%, the risks of major macrovascular events and death are only significantly lower down to levels of 6.5%. This reinforces current guidelines which recommend lowering HbA1c to levels below 7.0% and as low as 6.5%.

Conflict of interest:
Paid lecturing: Sophia Zoungas, John Chalmers, Bruce Neal, Michel Marre, Chang Yu Pan, Anushka Patel and Mark Woodward have received lecturing fees from Servier.
Advisory board: John Chalmers for Servier
Commercially-sponsored research: John Chalmers holds a research grant from Servier as principal investigator for ADVANCE.

D-0691

Improvement of glucose control in type 1 diabetes mellitus during last 15 years in Crete Island (Greece)

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Type 1 DM (T1DM) is a rare disease in Greece. Major changes in therapeutic approaches for T1DM occurred during last 2 decades but data for the impact of these on glucose control in our country is scarce.

Aim: The estimation of the improvement of glucose control as reflected in HbA1c changes in T1DM patients in Crete, during last 15 years
Methods: We retrospectively studied the records of the Diabetic Clinic of Venizelion Hospital, the major diabetic clinic in Heraklion (Crete, Greece) during the period 1988-2009.
We compared the Hba1c values of 3 different five-year periods: 1994-1998, 1999-2003 and 2004-2008. A patient was considered T1DM according to following criteria: age at onset <40 years old, prone to ketosis and need of continuous insulin treatment within 24 months from initial diagnosis. Low c- peptide was available as criterion for ambiguous cases. All patients were permanent citizens of Crete Island.
We excluded Hba1c values of T1DM patients in the first 2 years from the diagnosis of the disease.
HbA1c was estimated by DCA 2000 Analyser (Bayer) throughout all the follow up period.
Statistical analysis was carried out, as appropriate, using commercial available software (SPSS statistics, 17.0).
Results: Hba1c values from 238 eligible patients (Men 52,3%, Women 47,7%) were included.
A total of 2076 measurements of HbA1c recorded.

Table 1: summarizes our results for every five year-period.

A statistical significant reduction of Hba1c values for the whole population and for both sexes between the 3 five-year periods (t-test, p<0,001 in all cases) was recorded. In parallel a significant increase in the percent of values within the treatment targets is observed (x^2, p<0,01). There was no statistical significant difference in mean values of HbA1c between male & female in any of the 3 five-year periods. Also no statistical significance was observed between the 3 five-year periods for mean duration of diabetes per Hba1c value (t-test).
Conclusion: Our results reflect the improvement of glucose control during the last 13 years, possibly due to the intensification of the treatment (general use of MDI or pumps with frequent SMBG,) and to the use of high technology products (new insulins etc). Still the majority of Hba1c records, even during the last 5 years, are far from the treatment targets. Further efforts are required to help patients reach current targets of glucose control.

No conflict of interest

D-0692

IFCC HbA1c, fructosamine, random venous plasma glucose and estimated average glucose (eAG): relationships in diabetes

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Introduction: Recent international guidance recommends reporting of HbA_{1c} in both IFCC (International Federation of Clinical Chemistry and Laboratory Medicine) units mmol/mol and DCCT percentages, and also as estimated average glucose (eAG) mmol/L or mg/dL. eAG is derived from measured HbA_{1c} using formulae produced by a research study involving self-monitoring of glucose by patients and continuous blood glucose monitoring over 4 months. In addition, statements are awaited from the World Health Organisation and international, professional diabetes organisations on use of HbA_{1c} for the diagnosis of diabetes.
Aim: To describe the relationships of random venous plasma glucose (RPG), fructosamine and HbA_{1c} expressed in IFCC units and also as eAG in patients with diabetes recruited from a hospital diabetes clinic and also to compare them in patients with other co-existing illnesses.
Methods: HbA_{1c} was measured by IE HPLC on Tosoh G8 analysers (IFCC reference interval 20-42mmol/mol; DCCT 4-6%) along with glucose, fructosamine (200-285umol/L) and other related haematological (reticulocyte reference interval 20-80x10^9/L) or biochemical factors. All variables are quoted as median (IQ range).
Results: 96 (64 male) white Caucasian patients, 29 having type 1 diabetes were aged 61(51-71) years with BMI 31.5(26.8-35.6)kg/m^2.

Markers of glycaemic control	Results (n=96)
IFCC HbA_{1c} mmol/mol	60(53 – 69)
DCCT HbA_{1c} %	7.6(7.0 – 8.5)
eAG mmol/L	9.5(8.5 – 10.9)
Random venous plasma glucose (RPG) mmol/L	7.3(5.0 – 10.8)
Fructosamine µmol/L	310(268 - 355)
Other factors	
Hb g/dL	13.9(12.6 – 15.2)
Reticulocytes x10^9/L (n=65)	45.5(37.8 – 64.5)
Serum albumin g/L	46(44 – 47)
Albumin creatinine ratio (ACR) g/mol (n=71)	1.1(0.7 – 3.8)
Serum creatinine µmol/L	101(87 – 113)

There was significant correlation between RPG and IFCC HbA_{1c} (Pearson coefficient r=0.52) and RPG with fructosamine (r=0.46), both p<0.001. Individual patients were identified from other clinics whose indices of glycaemic control fell outside 2SD of the linear regression lines describing these relationships. They included patients with haematological disorders such as polycythaemia rubra vera (reticulocytes 140x10^9/L) or variant haemoglobin trait Hofu, and others with severe renal (ACR >500g/L) or liver disease.
Conclusions: Graphical representation of the relationships between these markers of glycaemic control will assist health care professionals when IFCC HbA_{1c} reporting is introduced. Care should be taken interpreting such markers when patients have co-existing illnesses.

Conflict of interest:
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Advisory board: None
Employee: None
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Other substantive relationships: None

D-0693

Evaluation of performance of a continuous glucose measurement device in subjects with type 1 and type 2 diabetes by means of a glucose clamp (hypoglycemia performance feasibility)

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Hypoglycemia has often been cited as a major barrier to attaining tight glucose control. Continuous glucose monitoring (CGM) technology with a high level of

table 1

	N	men	women	No of Hba1c	Hba1c (mean±sd)	percent of Hba1c values <=7%	percent of Hba1c values <=6,5%
Totally	237	124	113	2076			
1994-1998	105	59	46	436	9,2±1,77	7,6%	3,8%
1999-2003	144	73	71	682	8,59±1,36	11%	4,2%
2004-2008	183	98	85	958	8,17±1,49	21,3%	7,7%

accuracy in the hypoglycemic range may provide the opportunity for patients to obtain and maintain intensive control with limited hypoglycemia.
The primary objective of this feasibility study was to determine the performance of a new Continuous Glucose Monitor (CGM), specifically in the hypoglycemic glucose range.
14 subjects with type 1 or 2 diabetes underwent glucose clamp procedures. The evening before the clamp procedure 1 CGM sensor was inserted on each side of the abdomen in each subject (2/subject). The order of the glucose plateau periods and target glucose levels were: hypoglycemic (50 mg/dL), hyperglycemic (250 mg/dL), second hypoglycemic (50 mg/dL) and euglycemic (target glucose level of 90 mg/dL). The transition period between glucose plateaus was targeted at a 2 mg/dL per minute rate of glucose change.
Sensor insertion was successful on the first attempt for 25 of 28 sensors (89.3%). During the clamp procedures the investigational devices provided raw current results only. Results were converted to sensor interstitial fluid (ISF) glucose after the study was completed using an algorithm provided before the study began. The algorithm was designed to skip or abort data transmission under pre-defined circumstances. The total percent of minutes lost due to algorithm skips or aborts was 8.9%, the majority of which were due to two sensor aborts.
Plasma venous glucose measurements (using the Yellow Springs Instrument [YSI] glucose analyzer) were used for calibration. Plasma venous results for reference (comparison to CGM glucose) were measured at 5-minute intervals and Mean Absolute Percent Difference (MAPD) was determined. The smallest MAPD, 12.78%, was observed during the hypoglycemic plateaus (95% CI, 11.72 – 13.84) and the largest, 18.46%, during the euglycemic plateau (95% CI, 15.65 – 21.27). During the plateau and transition periods combined, mean absolute difference (MAD) for samples with YSI glucose levels < 75 mg/dL = 8.7 mg/dL and MAPD for samples with YSI glucose levels ≥ 75 mg/dL = 17.9%. Parkes Error Grid Analyses for the four plateaus (n = 873 paired data sets) showed that 86.8% of results were in Zone A, 12.2% in Zone B and 1% in Zone C.
A new CGM device and its attendant algorithm had a high degree of accuracy and reliability during a glucose clamp study with euglycemic, hypoglycemic and hyperglycemic plateaus. These results provide promise for future clinical application of this device.

Conflict of interest:
Employee: A Tideman, J Matson, S Pardo, JL Parkes, H Schachner DA Simmons are full time employees of Bayer HealthCare, DiabetesCare
Commercially-sponsored research: This research was supported by BayerHealthCare, DiabetesCare

D-0694

Characteristics of 24 hour glycaemic excursions revealed by continuous glucose monitoring in subjects with impaired glucose tolerance

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Aims: To reveal the characteristics of 24 hour glycemic excursions in subjects with impaired glucose tolerance (IGT).
Methods: The glycemic excursions and tendency of 37 newly diagnosed IGT subjects (aged 59(38~80)yrs, 16M/21F) and 41 normal glucose tolerance (NGT) subjects (aged 42(25~69)yrs,21M/20F) were measured by continuous glucose monitoring system (CGMS) for 3 days. The CGMS took the glycemic measurements for a total of 288 values every 24 hours.
Results: IGT group in comparison with NGT group exhibited significantly higher values (means ± SEM) of body mass index [(25.4±0.6) kg/m2 vs (22.8±0.4) kg/m2], systolic blood pressure [(131±3) mmHg vs (119±2)mmHg], HbA1c [(5.97±0.08)% vs (5.53±0.09)%] and triglyceride [(1.62±0.13)mmol/L vs (1.15±0.13)mmol/L] (all P<0.01). The profiles of the CGMS showed: There were significant differences in the average glycemic level [(5.31±0.08)mmol/L vs (6.26±0.11) mmol/L], the standard deviation of 24hour glycemic excursions [(0.88±0.04) mmol/L vs (1.34±0.08) mmol/L], and the difference between the maximal and minimal glucose values [(3.91±0.25) mmol/L vs (6.62±0.41) mmol/L] between NGT group and IGT group (P <0.01). 62.2% diurnal glycemic peaks occurred in 6am~10am period, but no glycemic peaks were observed during 9pm~5am period in IGT group. The values of postprandial glycemic peaks, time to postprandial glycemic peaks, the postprandial amplitude of glycemic excursions and the area under the curve (AUC) of postprandial glucose in IGT group were (9.68±0.33) mmol/L, (72.6±4.8) min, (3.77±0.32) mmol/L, (0.24±0.03) mmol/L·24h in breakfast; (8.51±0.22) mmol/L, (81.5±5.0) min, (3.20±0.26) mmol/L, (0.33±0.03) mmol/L·24h in lunch; (8.70±0.29) mmol/L, (86.9±5.1) min, (3.13±0.29) mmol/L, (0.33±0.03)mmol/L·24h in supper; respectively, which were all significantly higher than those in NGT group (all P<0.01). The glycemic peak of post-breakfast was higher than those of post-lunch and supper, but the AUC of post-breakfast was not higher than those of post-lunch and supper.
Discussion: Continuous glucose monitoring provided the greater details about the glycemic excursions and tendency throughout the day in IGT subjects. The glycemic profiles from the CGMS have a valuable role in identifying the characteristics of glycemic excursions and making the optimal treatment decisions in IGT.

No conflict of interest

D-0695

The impact of a national specialized center on glycemic control in youth with type 1 diabetes mellitus

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Background and aims: As cure for type 1 diabetes (T1DM) is still unavailable, the achievement of an optimal glycemic control represents the main therapeutic goal that will delay or prevent the development of chronic complications. The aim of the paper is to assess the impact on glycemic control in youth with T1 DM of a national center specialized in evaluation, treatment and diabetes education. In Romania this role is played by Clinical Medical Center Cristian Serban for Evaluation and Treatment for Children and Youth (CCS) from Buzias, nearby Timisoara, where young people with DM from all over the country are admitted. Through its profile, CCS is unique in Romania.
Material and method: Between 1999 and 2008, 580 T1DM patients aged between 19 and 30 years were admitted at least once in the CCS, for an average of 12 days; 269 patients were admitted once (A1), 192 twice (A2) and 119 three times (A3), at intervals between 6 months and 5 years. In all patients we performed: physical examination, frequent daily glucose monitoring (on average 5 times/day), glycemic profile (twice during admission), HbA1c (immunoturbidimetric method, normal range 4.5-5.7%), eye exam and albuminuria (immunoturbidimetric method). In 516 patients during A1 we measured fructosamine twice, in the first and last day of admission (normal range 205-285 mmol/L). Diabetes education consisted in 8 theoretical (on all aspects of T1DM) and 8 practical lessons (insulin injections, self-monitoring, dose adjustments, food weighing, etc.) with duration of 2x 45 minutes each. Insulin therapy used both human and analog insulin. We computed mean HbA1c and the percentage distribution of patients on HbA1c intervals for each admission (<7%; 7-7.9%; 8-8.9%; =9%), as well as mean fructosamine at admission and discharge.
Results: For the whole group, mean HbA1c was 9.37±2.39% (A1); 8.47±1.73% (A2) and 8.34±1.57% (A3). Differences were statistically significant between A1 vs A2 and A1 vs A3 (p<0.001), but not for A2 vs A3. Mean HbA1c was below 7% in 13.7% (A1), 19.46% (A2) and 18% (A3) patients; between 7 and 7.9% in 17.3% (A1), 23.5% (A2) and 25.2% (A3) patients; between 8 and 8.9% in 19.1% (A1), 22.3% (A2), 27.1% (A3) patients and =9% in 49.8% (A1), 34.6% (A2), 29.5% (A3) subjects. Mean fructosamine decreased from 435±96 mmol/L at admission to 387±85 mmol/L at discharge (p<0.001). Results are similar for all types of insulin used.
Conclusions: DM management in a national specialized hospital, where therapy is strictly monitored and intensive diabetes education is provided, leads, after repeated admissions, to a significant decrease of mean HbA1c, an increase in the proportion of patients with HbA1c below 7 % and between 7 and 7.9%, and the decreases of patients with HbA1c greater than 9%. The effectiveness of CCS is also shown by the decrease of fructosamine during hospital stay.

No conflict of interest

D-0696

The efficacy of lowering HbA1c with a gliclazide modified release-based intensive glucose lowering regimen in the ADVANCE trial

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Background: The ADVANCE trial (Action in Diabetes and Vascular disease: Preterax and Diamicron Modified Release Controlled Evaluation) has demonstrated that intensive glucose control with a gliclazide modified release (MR)-based intensive glucose lowering regimen in people with type 2 diabetes reduced the risk of combined microvascular and macrovascular events, primarily through reductions in the risk of diabetic nephropathy. In these analyses we examine the efficacy of this regimen in achieving good glycaemic control as reflected in the level of glycated haemoglobin (HbA1c).

Methods: All 11,140 patients randomised to receive either intensive (n= 5,571) or standard glucose control (n=5,569) were included in analyses assessing treatment efficacy as either the absolute HbA1c reduction, the HbA1c level achieved or the percentage of patients reaching various HbA1c targets (<=7.0%, <=6.5% and <6.0%) at the end of follow-up (median 5 years). Treatment efficacy was also examined in those receiving intensive glucose control according to subgroups defined by age, duration of diabetes, body mass index (BMI), HbA1c level and glucose lowering treatment at study entry (diet alone, monotherapy, or combination therapy with 2 or more oral hypoglycaemic drugs) using simple linear and multiple regression models.

Results: At the end of follow-up, in those patients assigned to intensive glucose control, HbA1c was reduced to a mean of 6.5%, with 81, 65 and 21% achieving HbA1c levels of <=7.0%, <=6.5% and <6.0% respectively, and 70% of patients receiving the maximum dose of gliclazide MR of 120mg. In contrast, in those assigned to standard control, HbA1c was reduced to7.3%, with only 50, 29 and 8% achieving comparable HbA1c levels. With intensive glucose treatment, substantial reductions in HbA1c were observed across all subgroups defined by baseline age, duration of diabetes, BMI, HbA1c or glucose lowering treatment at study entry (all p<0.0001). Moreover, at the end of follow up, HbA1c was reduced to 6.1% in those receiving gliclazide MR alone, 6.4% in those on other oral regimens including gliclazide MR, and 6.8% in those also requiring insulin. In a model including all these variables, the only independent predictors of reduction in HbA1c were baseline HbA1c and BMI (p<0.001). There was no weight gain in the intensive glucose control group and while severe hypoglycaemia was more frequent than in the standard care group, it was uncommon overall (0.7 vs. 0.4 episodes per 100 patient years).

Conclusions: Intensive glucose control with a gliclazide MR-based regimen was effective in lowering HbA1c, irrespective of age, duration of diabetes, BMI or HbA1c at entry, and irrespective of initial glucose lowering treatment. The decrease in HbA1c was more marked in those with higher HbA1c levels and lower BMI at baseline. The regimen was well tolerated without weight gain and with acceptable rates of severe hypoglycaemia.

Conflict of interest:
Paid lecturing: Michel Marre, Bastiaan de Galan, Sophia Zoungas, John Chalmers, Pavel Hamet, Bruce Neal, Anushka Patel, and Neil Poulter have received lecturing fees from Servier.
Advisory board: Michel Marre and John Chalmers for Servier.
Commercially-sponsored research: John Chalmers holds a research grant from Servier as principal investigator for ADVANCE.

D-0697

Average Daily Risk Range (ADRR), an index of glycaemic variability, correlates with oxidative stress in type 2 diabetic patients

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Aims: Recent studies suggest that glycemic variability and consequent oxidative stress causes diabetic vascular complication in type 2 diabetes. The aim of this study was to evaluate the association between Average Daily Risk Range (ADRR), an index of glycemic variability, and the degree of oxidative stress.

Methods: We conducted a cross-sectional study in 71 type 2 diabetic patients being treated with either oral hypoglycemic agents (OHA, n = 41) or insulin (n = 30). The mean age and duration of diabetes in study subjects were 54.1 ± 12.7 and 5.4 ± 7.1 years, respectively. As a measure of glycemic variability, ADRR was calculated from self monitoring blood glucose (SMBG) data recorded over fourteen consecutive days. Subjects were categorized into non-fluctuation (ADRR < 20) and fluctuation (ADRR = 20) group. Plasma nitrotyrosine was measured by ELISA as a marker of oxidative stress.

Results: 39 (54.9%) and 32 (45.1%) patients were allocated into non-fluctuation and fluctuation group, respectively. Fluctuation group was characterized by longer duration of diabetes (7.8 ± 8.6 vs 3.4 ± 4.9 years), higher prevalence of diabetic retinopathy (34.4 vs 12.8%) and higher levels of HbA1c (9.6 ± 2.0 vs 7.8 ± 2.2%), fructosamine (364 ± 65 vs 294 ± 88 μmol/L), fasting plasma glucose (181 ± 53 vs 150 ± 54 mg/dL), postprandial plasma glucose (312 ± 102 vs 242 ± 80 mg/dL), serum creatinine (0.9 ± 0.3 vs 0.8 ± 0.2 mg/dL), high-sensitive C-reactive protein (0.9 ± 1.7 vs 0.3 ± 0.4 mg/dL) and nitrotyrosine (32.1 ± 17.0 vs 17.7 ± 10.3 nM) compared with non-fluctuation group. ADRR showed positive correlation with nitrotyrosine ($r = 0.490$, $P < 0.001$) and their significant relationship was established independent of glycemic control status (HbA1c < 8%: $r = 0.528$, HbA1c = 8%: $r = 0.401$) or treatment modality (OHA: $r = 0.440$, insulin: $r = 0.501$). The independent variables showing statistically significant associations with ADRR were duration of diabetes (ß = 0.313, $P = 0.001$), HbA1c (ß = 0.313, $P = 0.001$), $HOMA_{IR}$ (ß = 0.259, $P = 0.004$) and nitrotyrosine (ß = 0.462, $P < 0.0001$). Fasting and postprandial plasma glucose, serum creatinine and fructosamine also correlated with ADRR, although the significance was lost after multivariate adjustment.

Conclusion: ADRR, an index of glycemic variability based on SMBG data, was significantly correlated with levels of nitrotyrosine. This suggests that ADRR could reflect the degree of oxidative stress in type 2 diabetic patients. Glycemic control should be focused not only on the level of HbA1c but also on the degree of glycemic variability.

No conflict of interest

D-0698

Glycaemic control in persons with diabetes in Africa: A Diabcare Survey of six countries

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Background: It is well established that glycaemic control is of utmost importance in the management of diabetes mellitus (DM). The gold standard for assessing glycaemic control is taken to be glycated haemoglobin, also referred to as HbA_1c. Reports of control levels using HbA_1c are few from Africa. The Diabcare project recently conducted a survey of the status of diabetes in six sub-Saharan countries, including measurement of HbA_1c levels.

Aim: To assess the status of glycaemic control in sub-Saharan African persons with DM using the Diabcare data methods.

Methods: Novo-Nordisk Diabcare survey was conducted in six sub-Saharan countries - Cameroun, Ghana, Kenya, Nigeria, Senegal, and Tanzania in 2008. Each patient completing the Diabcare questionnaire has his/her HbA_1c determined at the time of interview, in addition to obtaining basic clinical data recorded in the data collection form. HbA_1c level was determined using blood obtained by finger prick, with the result being available within ten minutes of blood collection.

Results: The frequency of HbA_1c testing varied widely between countries, with a regional range of 0-6 times per year and a mean rate of testing of about one

annually. In the cross-sectional testing, the mean HbA_1c was 8.5 (2.5)% with a regional range of 4.0-14.8%. The country means ranged from 7.5% to 9.0%. Using the IDF criterion of <6. 5% as good glycaemic control, only 26.6 % of the patients were in good control. Generally, there was a trend towards increasing frequency of chronic complications as the mean HbA_1c increased.
Conclusion: HbA_1c testing is infrequently performed in most African countries. Of those tested, satisfactory glycaemic control using the IDF criterion occurs only in a small proportion of patients. The level of testing and the outcome suggest that quality of diabetes care in sub-Saharan Africa leaves much to be desired. There is urgent need to improve the quality of care, which is essential to preventing or delaying long-term diabetic complications and improving the quality of life of Africans with diabetes mellitus.

No conflict of interest

EDUCATION

Professional and peer education

D-0699

National Initiative for Quality Assurance in Diabetes Care

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Background: The Diabetes Educator Section (DES), a professional section of the Canadian Diabetes Association, developed the Standards Recognition Program (SRP) in 1996, and revised it in 2004. The SRP program provides diabetes education centers with the opportunity to undertake a self-assessment process to achieve national recognition for programs that successfully meet the Standards for Diabetes Education in Canada. The process includes a committee of certified diabetes educators who review submissions, provide recommendations for improvements, and confirm recognitions. The Association formally acknowledges the diabetes education center with certification for a five-year period.
Aim: The purpose of the SRP program is to assess the quality of care and services in diabetes education across Canada, and ultimately improve the care and treatment for people with, or at risk of diabetes.
Method: The SRP program focuses on individuals with diabetes, their families and/or communities and is articulated in three categories: outcomes, processes and structures.
The outcome standard demonstrates both behavioral changes and client knowledge. The process standard measures how education is provided, while the third standard, structure, is the organization and support services in providing care.
Additionally, these three categories have multiple standards, with examples of indicators for each standard. Indicators are verifiable examples of how a standard is met. Diabetes education centers may have other indicators illustrating how a standard is met, and should submit supporting documents to incorporate these indicators for each standard.
Results: Evaluating the performance and effectiveness of diabetes education centers and/or programs against national standards for diabetes care provides several opportunities for quality assurance. These include *improvements to the quality of care and services* currently provided in diabetes education. The *identification of Centers or Programs as a best practice site*, while giving *constructive feedback* and *positive reinforcement* provided to clients and staff for improvement. Lastly, the opportunity for diabetes education centers to earn public and professional recognition as a center providing *Excellence of Care*.
Conclusion: The Diabetes Educator Section (DES) of the Canadian Diabetes Association supports the work of diabetes educators who are dedicated to benefiting people living with diabetes. The SRP process assists program sites to evaluate their current practice while exploring new avenues to improve both processes and outcomes of diabetes care.

No conflict of interest

D-0700

Enabling health care providers to deal with therapeutic education: the experience in the Cuban Diabetes Education Program

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Enabling Health Care Providers to develop patient's understanding, abilities and self confidence to cope with daily self-care is a difficult task not solving by clinic knowledge or skills. The **purpose of this paper** is to show the evolution of this subject in the Cuban Diabetes Education Programme.
Methods: Capability covers Health Care Providers countrywide taking into account that every member of the team needs to develop educational skills.
Results: Activities have evolved according to the Program development. At the beginning of the Program (1980-1985) Psycho pedagogic Courses were held on the traditional classes and conferences but the results on educating people with diabetes have not improved. Since 1986, workshops were organized all over the country, as well as training in Diabetes Care Centre. Health Care Providers learnt in the same interactive methodology, they later will introduce in education activities with people with diabetes. Participants in these activities have shown better results on educating patients. In 2000, another activity was added: a Diploma on Diabetes Care and Education, certificated by the different Medicine Schools of the country, is developed twice a year in the different provinces for Health Professionals at the Primary Health Care Level. Participants have improved the quality of therapeutic education in the diabetes services and have gotten a better comprehension and treatment adherence in people with diabetes.
Conclusion: Continuous capability of Health Care Providers has increased abilities to deal with therapeutic education task, improving quality of services and patient's comprehension, skills and behaviors on treatment requirements.

No conflict of interest

D-0701

Role-play for Certified Diabetes Educator (CDE) for developing communication skills, knowledge and attitude in clinical settings

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Aims: A certified diabetes educator (CDE) is a health care professional who has undergone specialized training and is certified to instruct diabetic patients on the management of their condition. We used the role-play method to assess CDEs, especially those who had only recently acquired the certification, on their communication skills, knowledge, and attitude in dealing with diabetic patients in clinical settings. We also attempted to explore the effects of these role-play sessions and the inadequacies of this model of training.
Methods: The role-play training sessions were held 10 times a year. The participants included 137 CDEs or those wishing to obtain this certification, who belonged to 19 medical facilities. They were mainly nurses, and some were dieticians or pharmacists. The participants were oriented to the role-play method and were divided into small groups. In each group, one member (either a participant or an instructor) played the role of the patient and was provided with a description of his/her role, while the other (e.g. another participant) played the role of a CDE and was given a specific topic of instruction. The participants exchanged their roles and received feedback from the other members of the groups and the instructors. Themes for role-play were subjects of high interest to the CDE, such as conducting a medical interview with a diabetic patient, introducing self-monitoring of blood glucose level, explaining the process of administering insulin injection. The skills of the participants were assessed by the instructors by using a rating form. After the session, all participants were encouraged to give their impression of the session and complete the questionnaires administered to them.
Results: Of the total number of participants, 78% completed the questionnaire, and almost all participants found the sessions helpful. The aspects that were viewed as advantageous included first-hand experience in dealing with patients; feedback, including constructive criticism; and understanding of the patient's point of view. The assessment of the communication skills, knowledge,

and attitude of the participants by the staff doctors tended to be viewed as a relatively subjective, but still effective, form of personal feedback.
Discussion: The role-play method of training was received well by the CDEs in Japan. However, since actual diabetic patients are diverse in nature, the CDEs may often be unable to associate the situations created during role-play with real-life situations encountered. To enhance the effectiveness of role-play sessions, we should create challenging cases that closely reflect actual situations. In addition, it is essential that we construct a structured assessment form such that impartial and better feedback is obtained from all the participants.

No conflict of interest

D-0702

Diabetes education: train-the-trainer programme on insulin therapy & administration

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Aim: The lack of trained diabetes educators and standardised diabetes (DM) care and education to train Healthcare Professionals (HPS) has been an issue impeding the delivery of high-quality DM education and care for people on insulin therapy. The non-profitable Association of Diabetes Educators (Singapore)(ADES) aims to provide HPS who are from institutions that lack DM care and education, with training through International Diabetes Federation (IDF) curriculum.
Methods: The ADES adopted part of the module in curriculum of the International Diabetes Federation (IDF) on insulin therapy. A one-day DM education programme on Insulin Therapy and Administration was conducted by ADES in May 08. Institutions (IS) that do not have full-time DM educators were invited to nominate staff nurses (SN) to attend Train-the-Trainer (TT) programme. A post-course learning action was set for SN to provide pass-it-on DM care and education sessions to at least 5 nurses in their institutions within 3 months using the given teaching slides in CD-Rom and paper-based resource booklets. Variables including ethnic, years of experience in nursing, contact of patients with DM, place of work, duration of last update in DM education, and numbers of completed post course forms endorsed by SN supervisors, were collected for analysis.
Results: Twenty-two SN attended the workshop. 54% of the SN nominated had more than fifteen years of nursing experience. In terms of involvement in patient care, 90 % of SN involved in some level of routine diabetes education and care for patients and 10 % of SN from training & education department. In term of ethnicity, 83 % of them were Chinese. 50% of nurses were from Community Hospital, 40% from Nursing Homes/Services, and 10% from teaching institutions. 77% of SN from private and non profitable IS were not updated on DM education in the last 12 months in their nursing practice. 90% of the SN completed post course action within 3 months.
Conclusion: The IDF Curriculum resources allow diabetes educators in ADES to provide consistent, evidence-based research and information to promote diabetes care and education amongst the healthcare professionals.

No conflict of interest

D-0703

Evaluating the effectiveness of using a Diabetes Needs Assessment Tool on health professionals' knowledge of diabetes and self-reported changes in clinical practice: a randomised controlled trial

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Aims: The medical profession has a tradition of self-directed learning based on the individual's identified priorities for learning. However, there is evidence that this ability to self-assess is limited, and that the least competent are also the least able to self-assess. It may therefore be of benefit to have some form of external assessment. Whilst many diabetes educational programmes have been explored, few have been assessed in a systematic manner. As diabetes is an increasingly prevalent disease, effective methods for the dissemination and understanding of clinical guidelines need to be explored. This paper describes a randomised controlled trial to evaluate the effectiveness of using an online Diabetes Needs Assessment Tool (DNAT) to improve health professionals' knowledge of how to manage diabetes; to evaluate the acceptability of this process of learning and self-reported changes in clinical practice as a result of this educational process.
Methods: *Design*: Multi-centred randomised controlled trial.
Outcome measures: Primary - diabetes knowledge at 4 months and secondary - self-reported changes in clinical practice and acceptability of learning materials.
Sampling: Health professionals, both doctors and nurses managing diabetes patients, were recruited from the UK and Germany.
Process: The DNAT is a computerised test that adapts to the knowledge level of the learner and is comprised of clinically rich case problems developed by a group of diabetologists/educationalists.
After giving consent, eligible registered participants were given an online baseline diabetes knowledge test and then randomised to one of two groups using a stratified minimisation method. The control group were only given access to online diabetes learning modules whereas the intervention group were also given the DNAT for a 4 month period. After this time, both groups were administered a second diabetes knowledge test and a questionnaire assessing the acceptability of the learning materials. One month later, all participants were asked to complete a questionnaire measuring self reported changes in clinical practice. On completion of the DNAT, a personalised learning report was created for each participant identifying needs alongside individualised recommendations of the most appropriate modules to meet those requirements.
Results: To date, 1286 participants have enrolled in the study (951 English language and 335 German language). The results of this study will be presented.

Conflict of interest:
Employee: Schroter S., Jenkins D., Probert C., Walsh K.

D-0704

Continuing education program for practical abilities of diabetes care nurses in Japan

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Aims: The purpose of this study was to develop the continuing education program in the diabetes care field in Japan. This time we plan to report a part of this study from the viewpoint of clinical knowledge of interpersonal relationship in Japanese nursing.
Methods: 1. The nurse managers and researchers involved in continuing education for diabetes care nurses by our evaluation index (We have developed "Evaluation index for nurturing practical ability of diabetes care nurses" in 2007) were interviewed regarding "the present conditions and issues concerning the evaluation" and data were analyzed. 2. Item of the evaluation index were on the basis of interview refined by 3 expert groups of certified diabetes care nurses in Japanese Nursing Association. 3. The continuing education program was created, which reflects the attributes of diabetes care nurses in Japan.
Results: 1. Practical roles include [role of providing patient with nursing assistance], [role of collaborating with medical professionals], [role of improving staff's assistance skill], [role of working in an organization], and [role of striving for self-education and self-study]. 2. The continuing education program for practical abilities from the viewpoint of clinical knowledge of interpersonal relationship include (1) three items, such as "Attitude as a specialist toward patient," and "understanding patient and Construction of a relation," and "Care of the using a nursing process Attitude toward their practice," refined base on their thoughts, (2) four items, such as "Adjustment of medical treatment and learning environment of patient" and "Information gathering required for nursing assistance," and "Providing of assistance skill," and "Care in the emergency," refined base on their actions, and (3) five items, such as "Developing interpersonal relationships" and "Patient satisfaction," and "Self-control action," and "Acceptance and decision-making of a patient of medical treatment action," and "An improvement of a patient's body condition," refined base on the results of their actions.
Conclusions: The result revealed the present conditions and issues concerning the evaluation, and many suggestions regarding continuing education by

nurse managers were received in Japan. As a result of verifying the validity and reliability of an evaluation index, the continuing education program from the viewpoint of clinical knowledge of interpersonal relationship in Japanese nursing, which consists of 12 items for diabetes nurses, were completed.

No conflict of interest

D-0705

Diabetes related knowledge among residents and nurses: a multicenter study in Karachi, Pakistan

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Objective: To evaluate and compare the knowledge related to the management of diabetes among nurses and trainee residents of internal medicine, family medicine and surgery at tertiary care hospitals of Karachi, Pakistan.
Methods: It was a Cross sectional study. A validated questionnaire consisting of 20 questions related to diabetes awareness was acquired through a study done at Thomas Jefferson University Hospital with the permission of primary author. The questionnaire was administered at 5 tertiary care hospitals in Karachi, Pakistan to residents and nurses in wards or after regular meetings after taking their informed consent. Statistical analysis was performed using SPSS software version 16. Statistical significance was considered to correspond to a *P* value =0.05.
Results: 169 internal medicine residents (IMR), 27 family medicine residents (FMR), 86 surgery residents (SR) and 99 nurses (RN) participated. The survey had a good reliability coefficient(Cronbach a of 0.81).The overall mean correct percentage was 50%.There was no difference in total scores of IMR & FMR(64% vs. 60%, p= 0.47).The total scores of SR and RN were quite low (39% & 31% respectively).Although FMR scored higher than IMR on items regarding outpatient management of diabetes, that difference was not statistically significant(p=0.128).For inpatient diabetes care the scores of IMR were higher than FMR but not statistically significant either (p-value 0.175).SR and RN had profound deficit in both inpatient and outpatient management. Surprisingly, despite the fact that RN are actively involved in in-patient management of diabetes, they didn't answer correctly on most of the items regarding in-patient management of diabetes (Mean score 40%).
Conclusion: Since the prevalence of diabetes has been rapidly rising, it has become one of the major public health problems. Pakistan is also one of those countries estimated to have the highest number of people with diabetes. To be able to face this enormous number of diabetes cases, health care providers need to have adequate knowledge to deliver optimal care to these patients. There are several studies that have examined the diabetes knowledge of nurses, but the data assessing the knowledge of diabetes among trainee residents' especially surgical residents is lacking. This study is of paramount importance because to date, we didn't find any published study evaluating diabetes related knowledge of trainee residents and nurses in Pakistan. Based on these results, there are significant gaps in diabetes knowledge among residents and nurses. Due to high burden of disease and considering the fact that our residents and nurses are actively involved in diabetes management, this raises important concerns and needs to be addressed.

No conflict of interest

D-0706

A model of education project for health care professional - a partnership between a scientific society and a laypeople association

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There is a lack of diabetes educators in Brazil. In order to develop a training course to educators, a laypeople association, Juvenile Diabetes Association (ADJ) joined with a medical society - Brazilian Diabetes Society (SBD). Together they adapted all their way of working and developed a diabetes education course based on IDF curriculum.
The main objective of the course was to training the professionals to develop diabetes education considering the needs, goals, and life experiences of the patients. This comprehensive way to educate can support informed decision-making, self-care behaviors, problem solving, and active collaboration with health care team, and improve clinical outcomes, health status, and quality of life.
Material and Method: A scientific council was created from both groups (SBD and ADJ) to review the IDF curriculum and to develop a program based on Brazil necessities focus on Diabetes Education in a interdisciplinary way. A group of psychologist, pedagogy, nurse, dietitian, physician, physical educator joined for 6 months to develop the program.
Program design: The program was divided in theoretical interactive exposition and workshops. The theoretical review consisted of Physiopathology, Epidemiology, and treatment of type 1, type 2 and gestational diabetes and their complications were presented as clinical cases with endocrinologist and members of the staff interacting during the presentation as an example of an interdisciplinary work. The fundamental concepts on health education were presented in a way to prepare the participant to develop an educational project at the end of the course. The workshops were designed to have at least 3 different working stations at the same time, being conducted by members of the staff, a nurse, or a dietitian. The workshop program included glycemia control, insulin and medication therapy, diabetic foot, carbo-counting therapy and nutritional aspect of diabetic disease.
It was planned to have 6 sessions in different regions of Brazil. For each session 6 -8 persons from the scientific council and a IDF-SACA diabetes educator were present, and 2 professional, from the next city where the course would be done were trained in advance for the next course to join the original group. It was 40 hours course for 60 health care professional working in diabetes education. All the participants were submitted to an initial test, and in the end of the course for the final certification they should have to develop an Educational Project to be analyzed by the scientific board.
Results: From May 2008 untill March 2009, 4 sessions were done (southeast, central and northeast of Brazil). We have trained 235 persons that now are qualified to train other diabetes educators as a team to improve the quality of life of diabetic patient.

No conflict of interest

D-0707

Partnering for success: developing a training programme for joint teams of lay and health care professional educators delivering DESMOND structured group education in diabetes

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Aims: To enable lay educators to successfully deliver structured group education in diabetes by: a) attaining an appropriate level of diabetes knowledge, b) fostering a positive team dynamic and c) developing effective group facilitation skills.
Method: A task group drawn from the DESMOND Lay Educator Study investigators, developed a training framework for lay educators. The group drew on findings from an action research project conducted by Leicester University which identified key obstacles for potential lay educators including: a) lack of diabetes knowledge; b) impact of learning for self-knowledge at the same time as learning for the role of educator; c) lack of sufficient experience in group work. The task group planned an iterative cycle of training and feedback beginning with an initial package of preparation, training and support carried out through centralised training days, specific DESMOND educator training and on-site practice delivering group education in local teams. A total of 12 lay educators (LEs) and 12 health care professional educators (HCPEs) working in 6 teams of 4 (2 LEs and 2 HCPs) took part in a 1-day preparation course. The

purpose of this day was to promote team work, introduce people to the study and prepare LEs for formal DESMOND educator training. Lay educators then attended the standard 2-day DESMOND educator training together with other prospective educators from around the UK.
In each of the 6 study sites, LEs delivered DESMOND in teams of 3 (1 HCPE & 2 LEs). The teams then came together for a formal feedback day to share their experiences and to highlight outstanding needs as individuals and as teams.
Results: As intended, the initial package had partly met the stated aims of the training. However, the feedback process was successful in identifying generic, team and individual training and mentoring needs. For the LEs, the generic needs were further opportunities for practice and developing diabetes knowledge. For HCP educators generic needs were around developing mentoring and feedback skills. Some teams recognised a need for team mentoring via an experienced trainer, and individuals expressed a variety of needs, generally focussed around delivery of the education programme.
Conclusion: In creating a successful training framework for any group it is crucial to use an iterative cycle of development for incorporating the feedback and experience of all participants. Training must also recognise that individuals develop at different rates and to be successful, must address specific individual needs in addition to those that are generic.

No conflict of interest

FOUNDATION SCIENCE

Insulin action

D-0708

Combined effects of atorvastatin and metformin on post glucose-loading changes in inflammatory process in patients with diabetes mellitus type 2

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Aims: Statin treatment has been suggested to improve survival in patients with atherosclerosis, but their effects on the glucose-induced variations of inflammatory markers are unknown. We examined the effect of atorvastatin when administered on top of conventional anti-diabetic treatment or diet, on glucose-induced variations of inflammatory molecules in patients with newly diagnosed diabetes mellitus type 2 (DM).
Methods: Seventy subjects with newly diagnosed DM were randomised to receive metformin 850mg/d (M, n=17), metformin 850mg/d+atorvastatin 10mg (M+A, n=16), atorvastatin 10mg/d with dietary instructions (A+D, n=18) or diet only (D, n=19). All subjects underwent glucose loading (75g oral glucose) at baseline and after 12 weeks of treatment. Blood samples were obtained at baseline and 3 hours post-loading, while serum tumor necrosis factor alpha (TNF-a) and soluble E-selectin (sE-sel) were determined at baseline and at 3h.
Results: Serum TNF-a remained unchanged after loading at baseline in D (1.38±0.17 to 1.33±0.18 pg/ml p=NS) and it was reduced after 12 weeks (1.70±0.23 to 1.32±0.14 pg/ml p<0.05). TNF-a remained unchanged in M at baseline (1.36±0.18 to 1.47±0.21 pg/ml p=NS) and after treatment (1.44±0.71 to 1.31±0.17 pg/ml p=NS) and were reduced in M +A (2.0±0.309 to 2.0±0.38 pg/ml p=NS at baseline and 1.87±0.12 to 1.74±0.12 pg/ml p<0.05 after treament) as well as in A (from 1.37±0.17 to 1.17±0.12 pg/ml p=NS at baseline and from 1.18±0.09 to 1.06±0.0087 pg/ml p<0.05 after treatment).
Serum sE-sel remained unchanged after loading at baseline in D (42.5±2.6ng/ml to 48.5±4.5 ng/ml p=NS) and was reduced after 12 weeks (44.6±2.8 to 40.3±3.0 ng/ml p<0.01). sE-sel remained unchanged in M at baseline (53.0±4.9ng/ml to 49.7±5.3 ng/ml p=NS) and after treatment (44.5±3.4 to 43.3±3.9 ng/ml p=NS after treatment), and were reduced in M+A (44.2±5.6 to 40.5±6.2 ng/ml p=NS at baseline, and 40.8±5.4 to 36.8±5.1 ng/ml p<0.05 after treatment), but not in A (39.7±6.6 to 35.5±6.1 ng/ml p=NS at baseline to 35.6±5.8 to 33.6±6.5 ng/ml p=NS after treatment).
Discussion/conclusions: Treatment with atorvastatin alone is unable to reduce inflammatory process induced by hyperglycemia in patients with newly-diagnosed diabetes mellitus. However, atorvastatin treatment reduces the post-glucose loading levels of sE-selectin and TNF-a, only when administered on top of metformin treatment in these patients.

No conflict of interest

D-0709

A selective impairment of hepatic versus adipocyte insulin action such that increased lactate flux from adipocytes, fuels excessive hepatic gluconeogenesis in programmed insulin resistance

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Background and aims: Lactate release from white adipose tissue is quantitatively important, generally accounting for 5-15% of total glucose uptake by small adipocytes and up to 35-40% of total glucose uptake by large adipocytes. Net lactate production per adipocyte is increased in first degree relatives of individuals with type 2 diabetes, whose fat cells are enlarged compared with controls. Insulin resistance and diabetes can be "programmed" in early life by e.g. poor nutrition. We aimed to establish whether programmed insulin resistance could reflect increased hepatic gluconeogenesis due to increased flux of lactate as gluconeogenic precursor from adipose to liver.
Materials and methods: Maternal protein restriction during pregnancy and lactation (Maternal Low Protein, MLP) was used as a model of early life programming of diabetes and insulin resistance. As MLP programming augments basal and insulin-stimulated glucose uptake, yet adipocytes are small, we examined whether MLP affected lactate production by isolated adipocytes. We studied adipocytes from young male offspring at 8 weeks of age in the prediabetic phase.
Results: Adipocytes from MLP offspring had 33% higher basal lactate production than control (Con) offspring. On increasing the glucose concentration, Con adipocytes responded with 54% increase in lactate production, whereas MLP adipocytes responded with a 2.2 fold increase in lactate production. Insulin was added to media containing 20 mM glucose to minimize any possibility that glucose availability might limit lactate production. While insulin addition only modestly increased lactate production with adipocytes from Con offspring (30%), insulin stimulation of MLP adipocytes led to a much greater stimulation of lactate production.
Conclusion: Hepatic gluconeogenesis is inappropriately increased in type 2 diabetes and insulin resistance. Our data demonstrate that adipocytes in a model of early life programming of insulin resistance have a predilection for lactate production. Epidemiological studies have suggested a link between basal lactate release and adipocyte insulin resistance; however, in the present research, MLP adipocytes were more insulin responsive as the stimulation of lactate release observed in response to insulin was greater than observed with Con adipocytes. Thus a selective impairment of hepatic versus adipocyte insulin action, allowing increased lactate production from glucose by adipocytes under hyperinsulinaemic conditions, would be predicted to allow a greater rate of hepatic gluconeogenesis when hepatic insulin action is compromised.

No conflict of interest

D-0710

TFE3 acts as a transcriptional activator in hepatic glucokinase gene expression

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Background: TFE3 (transcription factor E3) is a bHLH protein that was first identified and characterized in enhancer element in the immunoglobulin heavy-chain and T cell receptor gene. E-boxes, the *cis*-elements for bHLH protein binding, are located in the promoters of numerous genes involved in metabolism. Previously it was reported that TFE3 activates hepatic IRS-2, an important component of insulin signaling.
In this study, we demonstrate that glucokinase (Gck) gene, which is a key regulator of glycolysis in liver is upregulated by TFE3 at the transcriptional level.
Methods: Transcriptional activity of hGck promoter by TFE3 was measured by luciferase assay in HepG2 cells. Transient highly expressed TFE3 nuclear extract of HepG2 cell protein was used in EMSA to show the binding of TFE3 in hGck gene promoter. Chromatin immunoprecipitation (ChIP) was performed to show the binding of TFE3 to hGck promoter *in vivo*. Messenger RNA level of Gck was measured by real time PCR in the primary cultured rat hepatocyte which is infected with TFE3 adenovirus.
Results: *In silico* search suggested that there are several E-boxes in the human Gck (hGck) promoter. Luciferase assay showed that TFE3 activates the hGck

promoter activity by 20 fold. Introduction of mutation at the E-boxes resulted in the decrease of the transcriptional activity. EMSA and ChIP assay showed that TFE3 binds directly to hGck promoter. Infection of TFE3-adenovirus to primary cultured hepatocytes increased endogeneous hGck mRNA level. The transcriptional activation of hGck by TFE3 was greater in hepatocytes maintained in high glucose media than in low glucose media.

Conclusion: We demonstrated that TFE3 activates the gene expression of Gck by direct binding on Gck promoter.

No conflict of interest

D-0711

S6 ribosomal protein kinase 1 (S6K1) level in skeletal muscle cells is sensitive to nutritional manipulation

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Obesity, a result of disequilibrium between energy intake and expenditure, is the major predisposing condition for type 2 diabetes and cardiovascular disease. Insulin resistance can result from, and/ or worsen, the obese state. Hence understanding the molecular mechanisms of insulin resistance is critical to control of obesity and its consequences. The mTOR/S6K1 is a signalling pathway that is critical for insulin action and nutrient utilization. Upon stimulation by insulin or amino acids, mTOR is activated, leading to the activation of S6K1. This protein then promotes protein synthesis and growth by phosphorylating its effectors, including ribosomal protein S6 and the translation initiation factor eIF4B. However, over-activation of S6K1 is implicated in insulin resistance. Thus, while the functions of the kinase are essential, its over-activation is undesirable. It is crucial therefore to identify mechanisms regulating S6K1 functions. Its activity can be controlled by phosphorylation, but it is unknown if other mechanisms of regulation exist.

Aim and methods: To determine whether S6K1 levels are altered by nutritional manipulations, rat skeletal muscle cells (L6 myoblasts) were grown in a complete medium (AMEM, supplemented with 10% FBS), or in a medium that contained 11 mM glucose but lacked amino acids and growth factors for up to 24 h. Another group of starved cells was re-fed for 1-4 h in the complete medium. S6K1 levels were then detected by immunoblotting.

Results and discussion: We observed starvation-induced, time-dependent attenuation of S6K1 protein level: at 6 and 24 hours, starved cells had, respectively, 25 and 50% decrease in S6K1 compared to control ($P<0.05$). In parallel, phosphorylated S6 and eIF4B (measures of S6K1 functions) were barely detected in starved cells, compared to control or re-fed group. We then examined mechanisms behind this regulation. Ubiquitination is a post-translational modification that regulates protein function and degradation. Remarkably, elevated ubiquitination of S6K1 was observed in both the control and the starved-refed groups; little ubiquitination was seen in the starved group. However, when starved cells were incubated in the presence of MG132, an inhibitor of the proteasome, increased ubiquitinated S6K1 was detected, suggesting the involvement of the ubiquitin proteolytic system in regulating the kinase.

Conclusion: Our data point to novel mechanisms of regulating S6K1 activity that may prove critical in controlling the functions of this kinase especially in conditions such as obesity and insulin resistance.

No conflict of interest

D-0712

Amino acids stimulate protein anabolism and attenuate fed-state glucose uptake in healthy young men

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We have shown a greater increase in protein anabolism, associated with lower glucose infusion and utilization rates, in a fed steady-state clamp (Hyper-3: insulin 798±74 pM, glycemia 7.9±0.0 mM, branched-chain amino acids [BCAA] 740±10 μM, n=9). These differences occurred when compared with a Hyper-1 clamp (insulin 450±22 pM, glycemia 5.5±0.0 mM, and BCAA 359±8 μM, n=10). Since endogenous insulin contributed to the higher than Hyper-1 postprandial hyperinsulinemia in Hyper-3 (C-peptide increased 5 fold), we performed a Hyper-3PC (pancreatic clamp) with octreotide and exogenous insulin, glucagon and growth hormone infusions. This suppressed C-peptide 46%, achieved insulinemia of 524 pM, with identical hyperglycemia and BCAA (n=9). Comparisons were made among these protocols in the three groups of men of similar age (26±1 yr), BMI (22±1 kg/m^2) and fat-free mass (FFM, 60±1 kg). Protein turnover (in μmol/kgFFM•min) was estimated by primed-continuous infusion of ^{13}C-leucine and that of glucose (in mg/kg•min) by ^{3}H-glucose. Amino acid infusion rates were identical in Hyper-3PC (130±4) and Hyper-3 (142±9), and greater than in Hyper-1 (49±2 mg/min, $P<0.01$). Suppression of leucine endogenous Ra (protein breakdown) was -0.86±0.05, -0.64±0.11 and -0.43±0.06 respectively (Hyper-3PC > Hyper-1, $P<0.001$). Stimulation of nonoxidative Rd (synthesis) was 0.40±0.05, 0.78±0.06 and 0.39±0.07 (Hyper-3PC and Hyper-1 < Hyper-3, $P<0.05$). Increase in net balance (anabolism) was 1.26±0.06, 1.42±0.09 and 0.82±0.03 (both $P<0.001$ vs. Hyper-1). Leucine oxidation was markedly increased to 1.5±0.1 and 1.6±0.1 vs. 0.6±0.03, ($P<0.001$). Glucose infusion rate was 5.4±0.3, 7.1±0.6 and 8.3±6 (Hyper-3PC $P<0.05$ vs. both). Endogenous production was inhibited similarly, but utilization increased to only 5.6±0.3, vs. 7.0±0.5 and 8.0±5 ($P<0.05$), such that M (Rd/insulin) was 0.82±0.07 and 0.65±0.10, vs. 1.25±0.10 (mg/min•pM, $p<0.01$). Therefore, with the postprandial hyperinsulinemia of Hyper-3PC, similar marked stimulation of anabolism occurred as with Hyper-3 clamps, though by somewhat different effects on synthesis vs. breakdown, perhaps related to different portal insulinemia. Postprandial hyperaminoacidemia to levels that exceed the maximum capacity for incorporation into protein synthesis results in their oxidation, that could be responsible for a physiological (not necessarily an insulin resistance-mediated) attenuation of the increased glucose uptake. As these findings were found in healthy, young, insulin-sensitive subjects, they may represent normal physiological mechanisms to maintain glucose and amino acid homeostasis, when provided in excess of immediate needs.

No conflict of interest

D-0713

Quercetin decreases inflammatory response and increases insulin action in skeletal muscle of ob/ob mice and in palmitate- and TNF-alpha-treated L6 myotubes: possible role for the negative regulation of JNK phosphorylation and NF-kappaB activity

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Quercetin, the most abundant flavonoid present in plants, is a potent anti-inflammatory that has been described to increase insulin sensitivity in obese rats through an unknown mechanism. In the present study we demonstrate that long-term intraperitoneal quercetin treatment increased whole-body insulin sensitivity in ob/ob mice, as assessed by insulin tolerance test (204%). In skeletal muscle of ob/ob mice, quercetin decreased JNK phosphorylation and IL-6 and IL-1 expression (respectively to 62%, 85% and 24%) and increased GLUT4 expression (151%). In vitro treatment of L6 myotubes with TNFa and palmitate decreased, as expected, insulin-induced glucose uptake (respectively to 28% and 50% vs. untreated cells). Previous addition of quercetin (48 hours) abolished this diabetogenic effect of TNFa and palmitate on L6 myotubes. In parallel, TNFa and palmitate reduced insulin-induced Akt serine phosphorylation (respectively to 45% and 42% vs. untreated cells) and increased JNK phosphorylation in myotubes (respectively to 195% and 215% vs. untreated cells). Quercetin effectively prevented the increase of JNK phosphorylation induced by TNFa and palmitate and the downregulation of Akt phosphorylation induced by TNFa. However, quercetin had no effect on the downregulation of Akt phosphorylation induced by palmitate. Additionally, palmitate increased nuclear accumulation of NF-kappaB proteins (580% for c-Rel, 172% for p50 and 340% for p52 vs. untreated cells) and binding to the GLUT4 promoter (125% vs. CTL) in myotubes. This effect was accompanied by downregulation GLUT4 content (56% vs CTL). Quercetin also suppressed palmitate-induced iNOS and TNFa expression in L6 myotubes. In conclusion, our results show that quercetin reduces insulin resistance in obese mice by suppressing the inflammatory response and enhancing GLUT4 expression in skeletal muscle. This quercetin property probably involves inhibition of TNFa and palmitate effects upon inflammatory pathway, as observed in L6 myotubes. These are the first results describing the quercetin improvement of insulin action in skeletal muscle, and highlights this flavonoid as a candidate for prevention and/or treatment of obesity-related insulin resistance.

No conflict of interest

D-0714

Toll-like Receptor 2 (TLR2) improves cellular inflammation induced by diet-induced obesity, but worsens glucose tolerance

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There are convincing evidences that the activation of JNK, IKK and iNOS are associated with insulin resistance, but only recently it has been demonstrated that those pathways can be connected to the insulin resistance by membrane receptors, such as Toll-like Receptors (TLRs). Studies from our laboratory demonstrated that mice with an inactivating mutation of TLR4 are protected from diet-induced obesity (DIO), IKKß and JNK activation, and insulin resistance. However, none of these studies have characterized the role of TLR2 in animal models of insulin resistance. Therefore, the goal of the present study was to investigate the role of TLR2 in DIO and insulin resistance. We investigated the weight gain, the sensitiv and signaling of insulin in liver, muscle, hypothalamus and white adipose tissue of TLR2 knockout (KO) mice fed a standard chow or a high-fat diet (HF). The insulin sensitivity was investigated by euglycemic-hyperinsulinemic clamp, the cell signaling was studied by Western Blotting and the serum insulin was determined by ELISA. Mice fed a standard chow, the TLR2 KO mice and their controls, were similar concerning the weight gain and the insulin resistance, but the TLR2 KO mice fed a HF presented similar degree of insulin resistance and higher weight gain than their controls fed a HF. The investigation of inflammatory pathways, such as JNK, IKK and tissue expression of IL-6, indicates that TLR2 KO mice fed a HF showed a decrease of the activation of the inflammatory pathways, such as JNK and IKK, and a decreased tissue expression of IL-6, indicating a reduced subclinical inflammation. Nevertheless, TLR2 KO mice fed a HF had higher fasting blood glucose than their controls, as they do with blood glucose during GTT, in parallel with a lower level of serum insulin in 30 minutes after the glucose infusion of GTT. Therefore, the results show that TLR2 KO mice fed a HF present, compared with their controls: 1. higher weight gain; 2. less evident subclinical inflammatory process; 3. decreased insulin secretion and worsening of glucose tolerance. In conclusion, the results of our study suggest that TLR2 protects from DIO subclinical inflammation in liver, muscle, white adipose tissue and hypothalamus, but worsens insulin secretion and glucose tolerance.

No conflict of interest

D-0715

Macrophage secreted factors inhibit cdk2 activity in preadipocytes

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Background and rationale: Macrophage infiltration in adipose tissue may contribute to adipose tissue dysfunction by inhibiting adipogenesis, leading to hypertrophied, inflamed, and insulin-resistant adipocytes. Our laboratory has previously reported that macrophage-conditioned medium (MacCM) from murine J774 and human THP-1 macrophages inhibits the adipogenic response of murine 3T3-L1 and human preadipocytes in culture (1). We have reported that early exposure (first 48 hrs of the 8 day protocol) of 3T3-L1 preadipocytes to J774-MacCM is required for the anti-adipogenic effect (2). This early phase of adipogenesis is characterized by mitotic clonal expansion that involves phosphorylation of the Retinoblastoma protein (Rb). The J774-MacCM severely inhibited mitotic clonal expansion as well as Rb phosphorylation.
Aim: Determine if cdk2, an upstream kinase that phosphorylates Rb, is inhibited by MacCM.
Methods: J774 macrophages were grown to ~90% confluence, then placed in fresh growth medium (DMEM containing 10%FBS and antibiotics) for 24 hrs. J774-MacCM, as well as control medium not exposed to macrophages, were collected and used to induce differentiation of confluent 3T3-L1 preadipocytes. To evaluate differentiation, J774-MacCM and control medium were supplemented with 0.25 µM dexamethasone and 0.5 mM isobutylmethylxanthine for the first 2 days, and 1 µM insulin for the first 4 days. Non-differentiated preadipocytes were kept in corresponding medium without adipogenic inducers. On day 8, the extent of the adipogenic response was visualized and quantified by triacylglycerol accumulation. Cdk2 expression was assessed by immunoblot analysis. Cdk2 activity was determined in cdk2 immunoprecipates, by measuring the incorporation of radiolabelled phosphate into histone H1 by autoradiography.
Results: The inhibition of adipogenesis by J774-MacCM was confirmed, shown by the 87% reduction in triacylglycerol accumulation ($p<0.05$; n=3). There were no apparent changes in cdk2 expression over the first 48 hrs following addition of adipogenic inducers, in the absence or presence of J774-MacCM. Activity of cdk2 was measured at 20 hrs following induction of differentiation. Under standard differentiating conditions, cdk2 activity increased 5-fold ($p<0.01$; n=3) from control (non-diffferentiating). In the presence of J774-MacCM, the increase in cdk2 activity was strongly inhibited by 83% ($p< 0.01$; n=3).
Conclusion: J774-MacCM inhibits the increase in cdk2 activity and Rb phosphorylation that normally occurs in response to adipogenic inducers.
1) Constant et al, Diabetologia 2006 49:1402-11 2) Yarmo et al, Exp Cell Res 2009 315:411-8

No conflict of interest

HEALTHCARE AND EPIDEMIOLOGY

Indigenous populations

D-0716

Forecasting future diabetes incidence in Canada using FINDRISC

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Aims: To describe the distribution of type 2 diabetes risk within the general Canadian population at large using risk scores from Finland's FINDRISC questionnaire.
Methods: This analysis is based on self-reported data from PHAC's 2009 National Prediabetes Survey, a stratified random digit dialled (RDD) phone survey of the general population between ages 30 to 75 (n=1755). This analysis was restricted to ages 40 years and over without diagnosed diabetes, and then weighted by age, sex and province. Information for 8 self-reported questions were assigned scores based on the FINDRISC diabetes questionnaire, and then summed to estimate the total risk score for each respondent. These scores were derived from the cohort experience in the Finnish Diabetes Study.
Results: The total cumulative incidence of type 2 diabetes in Canada over the next 8 to 10 years is estimated at 1.4 million cases, for those currently age 40 years and over. The distribution of diabetes risk is concentrated in a relatively small portion of the adult population: roughly half of all incident cases will derive from only 11% of the population, those comprising the moderate/high risk cases with FINDRISC scores above 14. Low risk cases with FINDRISC scores under 7 comprise over one-third of the total target population, yet will only contribute 5% of new incident cases over the next 8 to 10 years.
Discussion/Conclusion: Current screening recommendations suggest regular screening for all asymptomatic adults over 40 years of age every three years, or more often in the presence of various risk factors. This analysis suggests that diabetes risk is concentrated in a relatively small portion of the population, who could be identified using inexpensive risk scoring questionnaires, such as FINDRISC, as an initial pre-screen in order to improve the efficiency and effectiveness of overall screening efforts.

No conflict of interest

D-0717

Ethnic disparities in some type 2 diabetes intermediate outcomes are shown to be diminished by 5 years of primary health care intervention based on annual reviews

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Aim: To observe the impact of 5 years of primary care annual review examinations on ethnic disparities in intermediate outcomes of Type 2 diabetes care.
Methods: Within the New Zealand community Maori and Pacific persons have had lower uptake of, and poorer results from, diabetes care. In 2000, a

government-sponsored nationwide programme of free-to-the-patient annual review of their diabetes was instituted. Payments to primary care were made on completion of a defined clinical and laboratory dataset returned from the areas served by Capital and Coast, Hutt Valley, and Wairarapa District Health Boards (approximately 10% of the 4 million population of New Zealand) to the database coordinator at the Wellington Regional Diabetes Trust. From the database of 49,965 annual reviews on 19,054 persons with diabetes, to the end of 2006, those with Type 2 diabetes who had had five or more completed annual reviews were selected and analysed here.

Results: The cohort comprised 2967, males 50.8%, ethnicity Asian 10.2%, European 69.5%, Maori 10.0%, Pacific 8.6%, median age at latest review 69 years.

Weight was strikingly different between ethnic groups, averages being respectively (in alphabetic order) initially 68.7, 84.6, 94.0, 94.5 and by year 5 had reduced little 68.6, 83.5, 92.7, 92.8.

HbA1c initial means 7.48, 7.12, 8.00, 8.32 by year 5 were 7.44, 7.26, 7.98, 8.24.

Cholesterol total initial means 5.51, 5.44, 5.68, 5.56 fell spectacularly to 4.63, 4.60, 4.61, 4.65 mmol/l concomitant with Statin use rising from 15, 23, 18, 7 to 61, 61, 67, 54 %. Triglyceride mean levels reduced from 1.95, 1.96, 2.77, 2.05 to 1.71, 1.75, 2.04, 1.72 mmol/l.

HDL cholesterol initial means 1.28, 1.27, 1.20, 1.24 rose to 1.46, 1.44, 1.33, 1.40 mmol/l.

Systolic BP initial means 135.4, 142.5, 139.0, 139.5 fell to 133.8, 140.1, 136.6, 135.9 mm Hg and diastolic BP 78.9, 79.1, 83.0, 83.2 fell to 76.1, 76.0, 79.1, 79.3 concomitant with ACE inhibitor use rising from 35, 46, 55, 48 to 51, 63, 75, 72%.

Urinary albumin/creatinine median values 1.4, 1.0, 2.7, 3.5 became 1.4, 1.2, 1.7, 3.1mg/mmol.

Current smoking 4.5, 8.5, 27.5, 15.7 reduced a little to 4.2, 8.0, 21.8, 12.2 %. The changes were linear over the five years of annual reviews except for urinary albumin/creatinine ratio which tended to fall a little then rise.

Conclusions: The closing of the ethnic differences in serum lipids and the fairly uniform BP response to intervention establish that ethnic differences can be reduced and even abolished. That these successes depend on pharmacotherapy rather than life style change raises the need for better ways of addressing the unresolved differences in weight, and smoking in particular, but also in glycaemic control where both more lifestyle coaching and more intense pharmacotherapy may be required.

No conflict of interest

D-0718

The association of fat distribution and components of the metabolic syndrome in the mixed ancestry population of South Africa

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Background: The metabolic syndrome (MS) is currently one of the major challenges facing public health globally. The consensus risk factors are raised triglyceride levels, increased blood pressure, raised plasma fasting glucose or reduced high-density lipoprotein (HDL) levels. The waist circumference and/or waist-to-hip (WHR) ratio are commonly used as indicators of fat distribution and are consequently a measurement for the risk of MS. However, differences in body structure of various ethnic groups have been observed. For example, in Caucasians a larger hip circumference is dissociated with MS. The unique Mixed Ancestry population of South Africa is a combination of European settlers and the indigenous Africans and may therefore have different associations altogether. The objective of this study was to investigate the association of fat distribution as measured by waist circumference, hip circumference, Body Mass Index (BMI), and skinfold thickness with various components of MS such as blood pressure and lipid levels.

Methods: The Bellville South Study is a cross-sectional and prospective study of the Mixed Ancestry population of South Africa. In this study we analyzed the risk factors for MS in 600 randomly selected Mixed Ancestry individuals. The waist circumference, hip circumference, BMI, blood pressure and lipid levels of the participants were determined. Linear logistic regression analysis was used to study association of fat distribution with lipid levels and blood pressure.

Results: The serum cholesterol, low-density lipoproteins (LDL) and HDL levels were significantly higher in females than in males ($P = 0.01$). Lipid levels increased with age except for the HDL levels in males which were similar for all age groups. In a logistic regression model with BMI, waist circumference, hip circumference and WHR as continuous variables, the waist circumference was associated with higher triglyceride levels ($P < 0.01$) while the hip circumference showed an opposite effect ($P = 0.01$). The reverse was observed with regards to HDL-cholesterol. Waist circumference was negatively associated with HDL-cholesterol ($P = 0.007$) whilst the hip circumference was positively associated ($P = 0.020$). Waist circumference, BMI and supra-iliac were positively associated with systolic and diastolic blood pressure ($P < 0.05$), whilst the hip circumference and triceps were negatively associated ($P < 0.05$).

Conclusion: As reported in Caucasian and other ethnic groups a larger hip circumference had a protective effect on some components of the metabolic syndrome. The present results suggest that the hip circumference be included in the assessment of the risk for metabolic syndrome in this population.

No conflict of interest

D-0719

Increasing incidence and prevalence with limited survival gains among rural Albertans with diabetes: a retrospective cohort study, 1995 - 2006

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Aims: To compare recent trends of diabetes prevalence, incidence and mortality between men and women living in urban and rural Alberta, Canada.

Methods: We tracked population trends in diabetes in adults based on diagnostic codes from provincial administrative health records from 1995 to 2006. Location of residence was defined by registered postal codes. Sex-stratified logistic regression with interaction terms were used to compare increases in rates over the past decade by location of residence, adjusting for age. Status Aboriginals were excluded from these analyses.

Results: Men living in rural residences had the greatest increases in prevalence, at 61%, from 3.6 per 100 in 1995 to 5.8 per 100 in 2006, compared to a 55% increase in urban men, from 3.9 per 100 in 1995 to 6.0 per 100 in 2006 ($p<0.001$). Prevalence among women increased by 50%, regardless of location. Diabetes incidence in rural men increased 61% while urban men had a similar increase of 59% ($p=0.177$). Incidence was lower in women in both urban and rural locations, at 5.6 and 5.3 per 1000 in 2006, representing increases of 51% and 49%, respectively. Overall mortality rates decreased by 34% for urban men and 8% for rural men with diabetes ($p=0.006$). Women with diabetes living in rural areas had no decline in overall mortality, compared to a 28% reduction in urban women ($p<0.001$).

Conclusions: Diabetes prevalence remains highest in men, with the greatest increases seen in men living in rural residences. While mortality rates have declined substantially over the past decade for those with diabetes living in urban settings, declines in mortality in rural areas have been much more modest (for men) and non-existent (for women). Our results suggest the need for improved health promotion and access to appropriate treatment for the growing number of people living with diabetes in rural areas.

No conflict of interest

D-0720

Agreement between the Canadian community health survey and the national diabetes surveillance system for identifying diabetes patients in Newfoundland and Labrador, Canada

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Aims: The specific objectives of this study are to

1. estimate the accuracy of the Canadian Community Health Survey in identifying diabetes cases as compared with the National Diabetes Surveillance System for the population aged ≥ 25 years,
2. assess sensitivity, specificity, positive predictive value, and negative predictive value of the Canadian Community Health Survey using the

National Diabetes Surveillance System as the gold standard for the population aged ≥ 25 years.

Methods: This study linked the National Diabetes Surveillance System (1998-2005) to the 2001, 2003, and 2005 Canadian Community Health Survey share files via health care number. The sample included individuals aged 25 years and older. The prevalence of diabetes from the National Diabetes Surveillance System and the Canadian Community Health Survey were compared and the sensitivity, specificity, positive predictive value, and negative predictive value of the Canadian Community Health Survey using the National Diabetes Surveillance System as the gold standard were determined.

Results: Among people aged 25 years and older, overall agreement between the Canadian Community Health Survey and the National Diabetes Surveillance System was substantial (Kappa = 0.71). Self-reporting of diabetes in the Canadian Community Health Survey was 72% sensitive and showed 98% specificity. Positive predictive value was 77% and negative predictive value was 97%.

Discussion/conclusion: This study highlights the importance of having correct estimate of diabetes prevalence for surveillance, research and planning purposes. These findings can support public health decision-making related to diabetes prevention and management.

No conflict of interest

D-0721

Monitoring diabetes outcomes across Europe, and beyond: the EU DG SANCO funded EUBIROD project

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Aim: The EUBIROD project, co-funded by the European Commission, started in September 2008 to implement a sustainable European Diabetes Register through the coordination of existing national/regional frameworks and the systematic use of the BIRO technology. A total of 22 participants from 20 European states, plus the Dasman Institute from Kuwait, will be connected through a system that will safely collect aggregated data and produce systematic EU reports for diabetes indicators, to be used for decision support in public health.

Methods: The workplan includes the following tasks: secure and privacy-safe data collection; development of epidemiological techniques to compute standardized diabetes indicators; development of a customized toolbox to facilitate the connection process and the transfer of technology; dissemination and training through the activity of BIRO Academy, which will establish an e-learning platform and residential training courses; evaluation, made by international experts, of completeness and information content of the statistical reports.

Results: By August 2011 the project will ensure the establishment of a stable network for data exchange at the international level and the creation of a common framework for standardized measurements whose users will be specifically trained. The main result arising from the project will be the annual production of the European Diabetes Report, consisting of an analysis of quality of care and outcomes in diabetes using standardized criteria on top of a database of over 500,000 subjects. The report will include a discussion of the results, targeted at providing valuable input for European policy makers, health care and scientific organizations, citizens.

Conclusion: The EUBIROD project further develops the platform established by BIRO and EUCID, whose results have raised the interest of the European Commission. The project will progress the construction of a unique diabetes information system that can be used in Europe and beyond, realizing a possible model for the automatic production of global IDF reports. More details available at http://www.eubirod.eu.

No conflict of interest

D-0722

Using administrative data to define diabetes cases in children and youth

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Background: Analysis of administrative data to monitor trends in diabetes (DM) prevalence and outcomes is an important tool used to inform practice and policy. The National Diabetes Surveillance System (NDSS) is a network of regional DM surveillance systems that compiles person-level administrative healthcare data for DM in Canada. The case definition, requiring that an individual have either 1 hospitalization or 2 medical claims coded as DM within 2 years, may not function optimally in populations with lower DM prevalence, such as those <20 yrs of age, where the impact of false positives will be amplified.

Aims: The objective of this project is to explore and validate DM case definitions in those <20 years in the province of Nova Scotia(NS) Canada.

Methods: The administrative database consists of provincial physician billing and hospital discharge files, containing comprehensive information about insured health services delivered to residents of NS since 1989. Health care in the province is publicly funded. Case definitions studied in this dataset were compared with provincial Registry data, considered the gold standard. The Diabetes Care Program of NS maintains a centralized Registry of individuals attending Diabetes Centres in NS. Incident DM cases for the < 19 years population are validated annually and capture is near complete in this age group (n=1235 for 1996-05). Datasets for 1996-2005 were linked using encrypted unique identifiers. Various algorithms were examined to determine the optimal case definition, including varying the number of DM codes required, time period, age, and number of diagnostic fields used to optimize sensitivity, specificity, positive and negative predictive value of the case definitions.

Results: The optimal case definition was 1 hospitalization or 2 MD visits in 1 year with exclusion of infants <4 months of age, using 3 diagnosis fields for hospitalization and 1 for MD visits with a sensitivity of 87.31% and specificity 99.92%. Given an estimated population prevalence of 0.0033, the positive and negative predictive values are 78.69% and 99.96% respectively. Extension of the time period to 2 or 3 years increased false positives without improving sensitivity. Addition of diagnosis fields was not beneficial. False negative ($p<0.05$) and false positive ($p<0.001$) cases were strongly associated with age group 16-20 years.

Conclusions: DM case definitions for individuals <20 years are adversely affected by accumulation of false positives. Even our optimal case definition only had a positive predictive value of 79%, making this method of finding cases in administrative data prone to unacceptable levels of error. All case definitions performed especially poorly in the 15-19 year age group. Registries will provide the most reliable source of identification of DM cases in this age group.

No conflict of interest

D-0723

Do geographical disparities affect the pattern of medication use in diabetic patients?

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Aims: The purpose of this study was to describe and understand the geographic variations in anti-diabetic medication use in the diabetic population in Quebec as recommended by national diabetes guidelines.

Methods: An exhaustive cohort of diabetics between 1997 and 2002 was constructed using the Quebec provincial health service database. Diabetes cases were determined using the Canadian National Diabetes Surveillance System's definition for administrative data. Patients were included if they were 20 years or older, living in Quebec and covered by the public drug insurance. Patients who were hospitalized or died during the one-year follow-up and patients who had gestational diabetes were excluded. The level of anti-diabetic medication use was measured using medication possession ratio (MPR) and categorized into: Regular users, for patients who filled prescriptions for a period of time covering at least 292 days (80% of the time); irregular users, for patients who filled at least one prescription but for a period of time less than

292 days; and non-users, for patients with no prescription filled. The level of anti-diabetic medication use was computed and mapped by age, sex and living area (Statistics Canada definition). Multinomial logistic regression was used to show variables associated with drug use categories.

Results: Among the 155,646 diabetic patients (mean age: 63 years ± 13) covered by public drug insurance, 34% never claimed an anti-diabetic prescription during the study period, 44% regularly claimed diabetes medications. Multinomial logistic regression showed that regular use of medications was positively associated with increasing age (P<0.0001) and living in a rural area (P<0.0001). Regular users were more likely to live in rural areas compared to irregular users (OR 1.26; 95% CI: 1.22-1.30) and compared to non-users (OR 1.10; 95% CI: 1.06-1.12).

Conclusion: Despite similar insurance coverage and drug benefits, geographic variations in the medication use among diabetic patients exist. After controlling for age and gender, diabetic patients living in urban regions were less likely than those in rural regions to use regular drug treatment for diabetes. However, these disparities may not be related to variations in the quality of available care and should be interpreted with caution.

No conflict of interest

D-0724

Populations in transition: how to measure the dietary component ?

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Aims: The «dietary transition» that accompanies rapid social change has been related to increased prevalence of obesity and type 2 diabetes worldwide, and in particular among aboriginal populations. Instead of using individual food/nutrient consumptions or complex dietary patterns as a measure of dietary changes over time, age and space, we propose a simple score developed in the framework of the «Dietary and health transition in French Polynesia» study.

Methods: Austral-born, Maohi participants aged 12-88 years (n=232) answered a 24-groups FFQ and one 24h-recall with 30% of replicates. We measured the fatty acid profile of red blood cell (RBC) membrane phospholipids as a surrogate for individual intakes of PUFA and trans-fatty acids. We calculated a «dietary transition score» (DTS) based on the sum of food frequency scores: local foods scored positively while store-bought-foods scored negatively. We compared scores across three age groups (12-17 years, 18-49 years, 50 years+) and two communities (urban-Papeete and rural-Tubuai) in order to assess generational as well as urban-rural gradients. We also measured fasting plasma glucose (FPG) and insulin (FPI), whole blood selenium, body composition, and urinary sodium and iodine.

Results: DTS varied greatly according to age: from -61.0±58.8 in teenagers to 12.3±52.9 in elders (p<0.0001), and community: -5.33±63.0 in rural-Tubuai and -33.9±62.7 in urban-Papeete (p=0.0006). There was a positive linear trend from teenagers in Papeete to elders in Tubuai. Total energy, carbohydrates, total fat, cholesterol as well as sodium intakes were higher in the 1st as compared to the 3rd DTS tertile. Moreover, DTS correlated positively with urinary iodine, whole blood selenium, marine omega-3 fatty acids in RBC, and negatively with omega-6 and trans-fatty acids as well as urinary sodium. Concomitantly, DTS correlated negatively with FPI, even after adjustment on age. As a negative score is indicative of a greater importance of «store-bought» as compared to «local» foods in the diet, this suggests that Maohi teenagers and those living in a urban environment are at a more advanced stage of dietary transition, which we found corresponds to generally less favorable nutrient intakes and higher FPI levels.

Conclusion: The simple dietary transition score we propose captures generational and geographical differences in food consumption patterns that may be relevant to the study of the ongoing health transition, in particular regarding early stages of insulin resistance and diabetes, in French Polynesian Maohi and other populations facing social change. This is of particular interest if at-risk groups are to be identified in order to propose relevant primary prevention programs regarding obesity and type 2 diabetes.

No conflict of interest

LIVING WITH DIABETES

Diabetes therapy

D-0725

Preferences of people with type 1 diabetes for infusion therapy: a pilot study

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Aims: Recent advances in anti-CD3 monoclonal antibody therapies offer the prospect of the amelioration of type 1 diabetes (T1DM). The present study was designed to understand the preferences of people with T1DM regarding different profiles of infusion therapy. A discrete choice experiment (DCE) was used in a survey of T1DM patients in the UK.

Methods: The optimal dosing schedules and likely benefits of infusion therapies in T1DM are currently being established in clinical trials. The current survey was designed to capture the preferences of people with T1DM regarding the length of infusion cycles, frequency of cycles, duration of benefit and nature of benefit. Levels for each attribute were based on current expert opinion and were combined into choice sets using fraction orthogonal design which had been folded over. Pairs of choice sets were presented to adults with T1DM who indicated which they preferred. Data were analysed using the conditional logit procedure.

Results: The results are expressed as odds ratios for ease of interpretation. Participants (*N*=49) preferred shorter and less frequent treatment cycles, longer duration of treatment benefit and preferred no insulin at all to a reduction in either basal or prandial dosing alone.

Conclusion: This survey shows the value that people place on a therapy that can reduce or eliminate the need for insulin therapy. This was a powerful driver of participants' choices even when treatment involved lengthy cycles of therapy on a frequent basis. The results indicate we believe that people understood the issues related to infusion therapy in diabetes despite never having experienced it.

See table 1

Conflict of interest:
Stock ownership: Kristina Secnik Boye Eli Lilly, Eric Sarpong Eli Lilly
Employee: Brad Curtis Eli Lilly, Kristina Secnik Boye Eli Lilly, Eric Sarpong Eli Lilly
Commercially-sponsored research: This work was sponsored by Eli Lilly and Co, Indianapolis, Indiana, USA
Other substantive relationships: Oxford Outcomes has been paid by Eli Lilly to undertake this work.

table 1

Attribute	Reference level	Level	Odds Ratio	Low 95%CI	High 95%CI
Length of treatment cycle	6 days	10 days	0.830	0.651	1.062
		14 days	0.767*	0.600	0.980
Frequency of cycle	6 monthly	12 monthly	1.496*	1.174	1.916
		18 monthly	1.406*	1.116	1.768
Benefit duration	2 years	5 years	2.418*	1.916	3.065
		Rest of patient's life	6.686*	5.053	8.846
Main benefit	No prandial dosing	No need for long-acting insulin	1.106	0.861	1.419
		No need for insulin at all	3.050*	2.316	4.015

D-0726

Prevalence of diabetes in a population based survey: preliminary results

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Aim: To assess the prevalence of diabetes by self-report (SR), percentage on current (past 2 weeks) therapy (CTx) and recent (last 12 months) therapy (RTx) by selected demographic characteristics using a portion of the preliminary results of the first ever national survey on ageing and health (SAGE) in South Africa.

Methods: A population-based representative household face-to-face survey was conducted in South Africa involving 4897 individuals from 4083 households. The survey instruments were based on the World Health Survey, with substantial revisions and additions based on a review of other major large ageing surveys, cognitive testing of a draft survey instrument and recommendations from a group of experts. The instruments include a standardized questionnaire including self-reported and objective health measures such as performance tests, anthropometry and biomarkers.

Results: Diabetes was reported by 6.72% of men (87.80% on CTx and 83.75% on RTx) and 10.57% of women (84.25% on CTx and 82.98% on RTx). In terms of age group, self-reported prevalence was 3.08% (75% on CTx and 75% on RTx) for participants aged 18-49 years, 7.73% (81.31% on CTx and 79.05% on RTx) for those aged 50-59 years, 11.72% (87.83% on CTx and 86.09% on RTx) for those aged 60-69 and 12.09% (87.95% on CTx and 85.54% on RTx) for those aged 70+ years. Self-reported prevalence was 11.84% in urban areas (85.35% on CTx and 82.80% on RTx) and 4.74% in rural areas (84.72% CTx; 81.95% RTx). In terms of marital status, self-reported prevalence for never married was 7.28% (90.48% CTx; 88.10 RTx), for currently married was 9.30 (84.55% CTx; 80.99% RTx), for cohabiting was 4.07% (75% CTx; 75% RTx), for separated/divorced was 6.20% (88.24% CTx; 82.35% RTx) and for widowed was 12.27% (84.13% CTx; 84.13% RTx)

Discussion and conclusion: Self-reported diabetes prevalence is high among women. Diabetes prevalence increases with increasing age, is high in urban and is lowest among individuals who are co-habiting. These self-reported results will be compared with subsequent HbA1c test results (not reported here). Although these preliminary results are only based on self-reported information, they indicate the need to develop health promotion programmes that take into consideration gender, age, place of residence and marital status. These findings have implications for health service delivery.

No conflict of interest

D-0727

Projecting the long-term outcomes in previously insulin-naïve patients with type 2 diabetes after insulin initiation with biphasic insulin aspart 30/70: a subgroup analysis of the IMPROVE™ study

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Aims: The IMPROVE™ study documented significant improvements in clinical endpoints after 26 weeks of biphasic insulin aspart 30/70 (BIAsp 30) treatment in a routine care setting. Based on data from the IMPROVE™ study the objective of the present analysis was to project the long-term clinical outcomes in type 2 diabetes patients previously only treated with oral antidiabetic agents (OADs), when initiated with BIAsp 30.

Methods: The IMPROVE™ study evaluated clinical outcomes in 52,419 patients after 26 weeks of treatment with BIAsp 30. Background and treatment data from 33,797 insulin-naïve patients previously treated with OADs were used in the present analysis. A validated computer simulation model of diabetes epidemiology (the CORE Diabetes Model) was used to make long-term projections of clinical outcomes based on patient characteristics (mean age 55.9 years, duration of diabetes 7.4 years, HbA_{1c} 9.2%, BMI 26.3 kg/m^2). In the model, patients were assumed to either continue on OADs or obtain the treatment effects of BIAsp 30 (HbA_{1c} improvement of 2.1 percentage points and 0.1 kg weight loss) observed in the IMPROVE™ study.

Results: The improved glycemic control with BIAsp 30 led to a projected delay in the onset of any diabetes-related complications of 0.7 years (2.1 vs. 1.4 years for BIAsp 30 and OAD respectively), e.g. the projected delay of myocardial infarction and stroke were 1.8 and 1.5 years, respectively. The cumulative incidence of complications was projected to decrease with BIAsp 30 in the majority of parameters studied, e.g. the cumulative incidence of severe vision loss was projected to decrease by 10.9% (1.1 %-point absolute risk reduction) and stroke by 6.2% (0.7 %-point absolute risk reduction). The average life expectancy was projected to increase by 1.5 years.

Conclusion: The long-term health outcome projections based on surrogate endpoints reported in the IMPROVE™ study, indicate that initiating treatment with BIAsp 30 in patients with type 2 diabetes rather than continuing on OADs will improve life expectancy, delay the onset of diabetes-related complications, and reduce their cumulative incidence over patient lifetimes.

Conflict of interest:
Paid lecturing: JG Gumprecht has received speaker's honoraria from Novo Nordisk Employee: TEC Christensen, Employee Novo Nordisk, TL Thomsen, Employee Novo Nordisk

D-0728

Low compliance to statins in Kerala rural population(DIABSCREEN KERALA-14)

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Cardiovascular factors rank first as major cause of mortality in diabetes. Intensive glycemic management has not yet proven clear benefits in preventing macrovascular complications of diabetes as seen in UKPDS, ACCORD etc., Diabetes is a coronary risk equivalent and there is undisputed evidence that dyslipidemia of any form should be aggressively managed. However widespread use of statins, despite scores of published supporting scientific data, is limited due to various factors. WHO estimates that 60% of the world's cardiac patients will be Indians by 2010. Nearly 50% of CVD-related deaths in India occur below the age of 70, compared with 22% in the West.

Diabscreen Kerala is a major project of P Kesavadev trust operating among the rural & urban population of Kerala. It includes free diabetes screening, interactive education and treatment with special focus on lifestyle modifications. The Diabscreen team consists of doctors, nurses, dieticians and other trained healthcare professionals. Apart from anthropometric measurements, blood is drawn for lab tests.

Of the 2877 participants from selected Diabscreen camps conducted in rural Kerala, 73% were found to be known diabetes subjects. Of these 28% had cholesterol > 220 mg% and were already prescribed statins at one time or the other by their treating physicians. Among these only 2.4 % were on steady medications while others discontinued.

Our Diabetes Care Team decided to analyze the non compliance by carrying out patient interviews with open-ended questions. The qualitative analysis of interview excerpts showed a mixed response.

Unnecessarily on an extra drug with no existing symptoms	46%
Misconception on adverse affects on kidney & liver function	28%
Took for 2-3-months and discontinued	17%
Cost of Statins	13%
Miscellaneous causes.	6%

Even among the educated patients, some kept away from ideal compliance due to the escalating cost of statins. Other aspects were patient negligence towards treatment as the disease was asymptomatic; the patient felt 'why take an additional drug unnecessarily'; misconceptions on the long term adverse effects of the drug such as damage to 'liver and kidney'; discontinuation of drugs when they found that lipids are in the normal range.

Over 80% of CVD deaths take place in low- and middle-income countries. By 2015, almost 20 million will die from CVDs, mainly from heart disease and stroke. These are projected to remain the single leading causes of death.

It is important that conventional risk factors for CVD like hypertension, smoking, sedentary life styles etc., have to be addressed. However in diabetes, statins are mandatory considering the economics of prevention of CVD.The poor compliance to statins calls for urgent intervention through structured, aggressive educational activities and free drug distribution whenever possible.

No conflict of interest

D-0729

The relationship between diabetes mellitus and health-related quality of life in Korean adults: the Korea National Health and Nutrition Examination Surveys 2007

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Aims: This study examines the relationship between diabetes mellitus and health-related quality of life (HRQL) in Korean adults and investigates the associated factors for decreasing HRQL in Korean diabetic patients.
Methods: A total of 2,644 participants (1,101 men, 1,543 women) aged 30 years or over in the 2007 KNHANES survey were included. HRQL was measured by the EQ-5D and EuroQol visual analogue scale (EQ-VAS). Mean age was 53.1±14.7 years and the prevalence of known diabetes was 8.0% (n=211). The EQ-5D utility scores were calculated by assigning utility scores to each of the health states in Korean adults.
Results: Mean EQ-VAS was 70.03±18.43 and mean EQ-5D score was 0.90±0.15 of total subjects. Compared to non-diabetic subjects, diabetic patients had a lower HRQL according to the EQ-5D (0.80±0.21 vs. 0.91±0.14, p<0.001) and EQ-VAS (60.5±21.8 vs. 70.9±17.9, p<0.001) after controlling for other related factors of age, sex, household income, and educational level. Among known diabetic patients, the associated factors for decreasing EQ-VAS were household income (beta=0.186, p=0.010) and sex (beta=-0.164, p=0.023), and the associated factors for decreasing EQ-5D were age (beta=-0.367, p<0.001) and sex (beta=-0.196, p=0.003).
Conclusion: Diabetes mellitus is associated with a lower HRQL, even after controlling for major associated factors of age, sex, household income, and educational level.

No conflict of interest

D-0730

Diabetes: the stubborn friend

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You might have been confused once you've read the title, I am sure a query like a new bad experience with Diabetes will be read, but I can consistently assure you that, after having this long relationship with Diabetes, I entirely believe that Diabetes was and will remain my lifetime best friend.
It was in 1992, when Diabetes first knocked my door and I was 9 years old, my family were extremely shocked, worried, and afraid! But they were sure that GOD Almighty tests us through this new comer. It was definitely not impressive receiving this Diabetes stranger who has just landed suddenly, without any prior notice or alert.
I returned back to school, shocked, in denial and loaded with vials of insulin and syringes, but over the years diabetes has gone from uninvited guest to just a part of who I am. For over the years, in moving from denial to acceptance, I learned how to live with it, and I do that well now.
Fortunately, during my early relationship with Diabetes, I was treated by a doctor who knows how to deal PSYCHOLOGICALLY with his patients, knows how to kick out any fear of Diabetes from the patient's family. He was one of the vital reasons that made Diabetes my Best Friend
If I am always going to be serious about taking good care of my Diabetes friend, this will let me live very pleasantly and quietly without causing any problems or hazards for me or my family. On the other hand, if I will lose interest about caring well for my Diabetes friend, it will hit back! And will never let me live well because I will always be paying too much to keep myself as well as my Diabetes friend surviving.
My Family helps me in converting my relationship with Diabetes from being an unfavorable guest to be my best friend. This came by encouraging and supporting me for being healthier, and having a better life style. If it was not for my Diabetes friend, I believe I would have never thought of organizing my life, nor living healthily.
Also, having an excellent and helpful group of people makes me feeling better and better in controlling my Diabetes friend. I usually like to spread my experience with Diabetes to people who have no idea about it, so I've found an association which aims at introducing Diabetes to all people with a mix of scientific and social way. Last year, I did register with Diabetes Youth Care Association (DYCA). I've found an excellent group of people, who are working hard to inform the society with definition of Diabetes and definition of a Diabetic person.
DYCA had helped me to spread out my experience positively. I did record a TV short speech talking about my experience with Diabetes and how to deal and live as any healthy person.This TV speech was broadcast on the World Diabetes Day Celebration in Cairo.

No conflict of interest

D-0731

Diabetes & tourism

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Throughout my study in the faculty of Tourism, I was not paying attention to medical issues such as Diabetes mellitus. For example when I open my T.V. watching medical program discussing diabetes mellitus types, symptoms, how to control I was easily able to switch to another channel. I was just feel pity when I heard about that type which begin at young age, wondering how these young people can cope with their illness.
They inject themselves everyday, they can't go out having fast food & desserts they like to have.They are all the time expecting complications.
But, it took me few minutes to think about this then back again to my life.
Then I had graduated & started my work in the field of tourism & get engaged.
After that an event happened in my life which changed a lot of my plans that I had to travel abroad & stay a long period of time away from my country, family, friends, fiancée.
I traveled already against my will, but I had to do this for the sake of our care together, that put me in very stressful condition I suffered a lot & I decided to get back to my country again.
When I get back I discovered that I had high blood glucose level & I had type I as my doctor told me afterwards.
I was shocked took me sometimes denying that I had this problem, then with help of my family I started to think how I am going to cope with this.
I started to follow my doctor instructions, learning new procedures which was new for me such as injecting myself insulin, diet instructions.
I started to read, search in the internet information about it.
More over my information about diabetes mellitus started to be reflected on my work as tour operator, I started to think about remedies & ideas that can help my tourists to enjoy their trips while they are controlling Diabetes well.
As tour operator, I am responsible of arranging tours programs including accommodations, tour sight seeing visiting, etc…
I started to ask our travel agents which I deal abroad to notify me about there is diabetic patients among the groups coming to us to arrange with the hotels for special requirements in diet for them.
In addition, I talked with one the hotel duty manger about the possibility of specifying corner in the dining room that fit with diabetic patients.
Before sight seeing tours I tried to give them full information about details of that day for the importance of good diabetic control because it require an extra effort.
I made suggestion to my boss about giving our tour leaders emergency course to how to deal with medical emergency that could happen during the trip esp. Diabetic coma.
My interest in this subject had emerged from my personal experience in that so I doing my best to know better about my disease and lower my customers suffering helping them to enjoy more with good health.

No conflict of interest

D-0732

Coping processes in people living with Diabetes Mellitus: experiences and challenges

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Aims: Coping processes are important to consider in the context of health care services of people living with Diabetes Mellitus, because they are related to other categories and dimensions related to psychological stability and the way of living of individuals and groups. Besides, it expresses the active role of the human being in its quotidian life, and it can even palliate the adverse effects of distress over health. This work intends to show how this field has been approached and the multiple dimensions are related to them, particularizing over socio-cultural aspects and sharing our research and assistance experience.
Methods: Scientific review about the field integrated to studies carried out by the author and to assistant experiences with people living with Diabetes Mellitus in psycho-social field.

Results: The work points out over the relevance of social support as one of the most important coping strategies in the process of living with Diabetes, mainly when this social support comes from family, health providers and other people living with Diabetes. According to the author's experience, there appeared some "problematic" moments during the process of living with Diabetes: the debut of the illness, the metabolic instability, and the presence of "complications". The more difficult aspects to cope with in the process of living with Diabetes are how to modify life styles, how to "accept" living with Diabetes and when needing to use insulin.

Discussion/conclusions: The work ends sharing comments and recommendations considered important to enhance active coping processes that promote wellbeing and quality of life in people living with Diabetes.

No conflict of interest

POSTER DISCUSSIONS

TUESDAY 20 OCTOBER

Biochemical complications

D-0733

Type 1 diabetes impairs muscle growth and absolute force production in developing skeletal muscle

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Background: Type 1 diabetes mellitus (T1DM) is often diagnosed in childhood, a time of growth and development. Studies into the effect of T1DM on growing skeletal muscle are limited, and those that have been performed have largely used the streptozotocin model. Unfortunately, streptozotocin itself directly causes myopathy independent of hypoinsulinemia/hyperglycemia.
Purpose: Thus, the purpose of this study was to utilize a non-pharmacological, partial pancreatectomy (Px) model to investigate the effects of T1DM on the properties of young skeletal muscle.
Methods: Male Sprague Dawley rats (5 weeks old) were randomly assigned to Px or Sham-surgery groups. At 4 or 8 weeks rats underwent *in situ* muscle stimulation to assess skeletal muscle force production and fatigue rates, and tissues were collected for further analyses.
Result: Px rats with significant elevations in glycemia (fasting >20mM) had lower body mass at the time of sacrifice vs Sham (4wk: 270±9 vs 341±7g; 8wk: 349±21 vs 484±10g, both p<0.05). Gastrocnemius-plantaris-soleus (GPS) mass was also reduced with T1DM at 4 and 8 wks compared to Sham (4wk: 1.2±0.06 vs 1.9±0.03g; 8wk: 1.8±0.1 vs 3.3±0.1g; both p<0.01). While Sham muscle grew 46% between 4 and 8 weeks, Px muscle growth was significantly attenuated during this time (only 27%, p<0.05 vs Sham). The reduced mass of T1DM muscle resulted in reduced absolute maximal force (F_{max}) production (4wk: 10±0.8 vs 15±1.6 N; 8wk: 23±1.8 vs 12±1.3N, both p<0.05). Stimulation of the GPS at ~50% F_{max} (2 min, of 3 sec stimulation, 3 sec rest) demonstrated a reduced rate of force decline in Px compared to Shams at both 4 and 8 wks (4wk: 61±4.5 vs 75±4.5%; 8wk: 53±3.4 vs 70±7.2% respectively; both p<0.05). Morphometric analysis demonstrated that Sham increased fiber size more than Px in both type IIa (69% vs 26%) and IIb/d (59% vs 15%) fibers, but not type I fibers (36% vs 21%).
Conclusion: Taken together, these data suggest that sustained hyperglycemia/hypoinsulinemia in young skeletal muscle significantly impairs growth and force production, primarily as a result of attenuated growth of type II fibers. This impairment may help to explain the functional defects including low aerobic capacity frequently observed in youth with poorly controlled T1DM.
This research was funded by NSERC.

No conflict of interest

D-0734

Association of C242T polymorphism of NADPH oxidase p22phox and I/D polymorphism of angiotensin converting enzyme with diabetes complications and cardiovascular risk in patients with type 1 diabetes

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Background and aims: Patients with type 1 diabetes (T1DM) present high morbidity due to its chronic complications, and genetic factors may lead to a higher individual susceptibility. In this cross-sectional study we aimed to investigate the association between C242T p22phox from NADPH oxidase and I/D angiotensin converting enzyme (ACE) polymorphisms, and the presence of microvascular diabetic complications and cardiovascular risk factors in patients with T1DM, and to compare genotype distributions between non diabetic subjects (controls) and diabetic patients.
Methods: Patients were evaluated for diabetic nephropathy and retinopathy, arterial hypertension, overweight/obesity, lipid levels, glycemic control, levels of C-reactive protein (CRP). DNA was isolated from lymphocytes from patients (n=128 for ACE analysis and n=93 for p22phox analysis) and controls (n=202 for ACE analysis and n=163 for p22phox analysis) using standard extraction technique. Genotype analysis was performed using Polymerase Chain Reaction for ACE I/D, followed by specific Rsa I restriction for p22 phox C242T polymorphism. P<0.05 was considered statistically significant. Data are shown as mean ± SD.
Results: Patients with T1DM were 28± 11.4 years old, 51.6% females, with duration of diabetes of 11.2 ± 8.2 years. The relative frequencies of the I/D ACE and C242T p22phox alleles were not different between controls and patients (II 15.3 *vs* 13.3 % ; DI 47.5 *vs* 51.5% ; DD 37.2 *vs* 35.%; p=0.751 and CC 50.3 *vs* 46.3% ; CT 36.8 *vs* 48.4%; TT 12.9 *vs* 5.3%; p=0.066).
Diabetic retinopathy and overweight/obesity were significantly more frequent in patients with DD genotype compared to those with II/DI genotype (33.3 *vs* 13.2%; p=0.009 and 32.6 *vs* 13.2%, p=0.034, respectively). The presence of the I allele (II/DI *vs* DD genotypes) was associated with lower levels of diastolic blood pressure (69.7 ± 12.3 *vs* 74.6± 13.1 mmHg, p=0.04). Diabetic incipient and overt nephropathy were not statistically different between patients with DD genotype compared to II/DI genotype (20 *vs* 33.3%, p=0.07). The presence of the C allele (CT/CC *vs* TT) was associated with higher levels of HDL cholesterol (50.1± 12.9 *vs* 38.2 ± 10.3 mg/dl, p=0.046). There was no association between ACE I/D or C242T p22phox polymorphisms and glycemic control, CRP levels, presence of dyslipidemia or hypertension. C242T p22phox polymorphism was not associated with the presence of diabetic retinopathy or nephropathy.
Conclusion: In our population composed of patients with T1DM the ACE I/D, but not C242T p22phox polymorphism, was associated with the presence of diabetic retinopathy and overweight/obesity as well as levels of diastolic blood pressure. This analysis may help to identify patients at higher risk for diabetes complications.

No conflict of interest

D-0735

The association between basal and change of serum C-peptide levels and vascular complications in Korean T2DM patients

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Aims: C-peptide has been widely accepted as the most appropriate measure of endogenous beta cell function because it is secreted on a basis equimolar to insulin. People with type 1 diabetes and higher fasting C-peptide values had lower prevalence of microvascular complications independently of duration of diabetes, A1C, and other risk factors. But there are only a few studies regarding the association between C-peptide and vascular complications in T2DM. Therefore, the purpose of our study is to assess the association between basal and change of serum C-peptide levels and vascular complications in Korean T2DM patients.
Methods: Out of 2010 T2DM patients cared for at the diabetes clinics at Soonchunhyang Hospital in Bucheon, Korea, we recruited patients being followed up at least two years during the period 2001-2006 (n=1351). For all patients, we retrospectively reviewed the clinical records about microvascular (retinopathy, neuropathy, nephropathy) and macrovascular (CVA, CAD) complications.
Results: The mean age, duration of DM, A1C and BMI in the 1351 patients were 57 years, 6.4 years, 8.4% and 24.7±3.8 kg/m2. Mean basal fasting and stimulated c-peptide levels were 2.58±1.83 ng/ml and 6.31±4.84 ng/ml. Fasting c-peptide levels were shown significantly negative correlation with age, HbA1C, duration of DM and HDL-C and positive correlation with BP, total cholesterol, triglyceride, LDL-C and hsCRP. Patients with microvascular complication showed significantly lower levels of basal stimulated and stimulated c-peptide levels and significantly higher levels of age, HbA1C, FBS, DM duration, systolic BP and creatinine levels. The prevalence of microvascular complications were significantly higher in those in the lowest quartile of basal fasting c-peptide (retinopathy, p=0.005, neuropathy, p=0.006, nephropathy, p=0.01) but no associations were evident with macrovascular complications. Differences between baseline and last c-peptide levels were not significant correlation with microvascular and macrovascular complications.

Conclusions: Our study shows association of plasma C-peptide levels with microvascular complications not macrovascular complications in T2DM patients.

No conflict of interest

D-0736

Hyperglycaemia: Effects on expression of genes affecting epithelial differentiation and vascularisation

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Background: : Wound healing is impaired in patients with diabetes. It would seem sensible that good glycaemic control should improve wound healing.
Aims and objectives: To determine if there is any difference in gene expression in skin of patients with diabetes and determine whether there was any difference between good and poor glycaemic control
Materials and methods: Skin biopsies of 2 cm^2 were obtained from forearm of 3 groups of male volunteers (20-45yrs): 5 patients in each group
(i) Healthy non-diabetics (control)
(ii) Type 1 Diabetics with poor glycaemic control (HbA1c >9.5): poor control group
(iii) Type 1 Diabetics with good glycaemic control (HbA1c < 7.5): good control group
Samples were frozen immediately in liquid nitrogen and transported on dry ice. RNA was isolated and analysed by Affymetrix micro-arrays.
3 groups of genes were analysed:
1. Markers of epithelial differentiation - trichohyalin, keratin 25, keratin 27.
2. Markers of vascular endothelial smooth muscle cells - alpha actin, myosin heavy chain and tropomyosin
3. Markers of neuronal cells - Purkinje cell protein 4 and somatopodin.

Results: The genes of all 3 groups were expressed at a much higher level in healthy subjects as compared to those with diabetes with poor glycaemic control. With good glycaemic control the level of gene expression was similar to healthy controls.
Conclusions: Poor glycaemic control possibly leads to poor wound healing as a result of alteration of expression of genes responsible for epithelial differentiation and vascular smooth muscle formation.

No conflict of interest

D-0737

Vitamin D deficiency among adults with and without diagnosed diabetes, U.S., 2001-2006

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The U.S. National Health and Nutrition Examination Surveys (NHANES, 1988-94) found that adults with diabetes and people from racial/ethnic groups at high risk for type 2 diabetes (t2DM) have lower levels of serum vitamin D, measured as serum 25-hydroxyvitamin D [25-(OH)D], compared to those without diabetes and non Hispanic whites. Few data exist about the prevalence of vitamin D deficiency (VitD Def).
Aims: We used recent national data to examine the association between diagnosed diabetes and VitD Def and to estimate the prevalence of VitD Def among adults with and without diabetes.
Methods: We used data from surveys of representative samples of U.S. adults (≥18 years) who participated in NHANES, 2001-2002 and 2005-2006. (No values were available for NHANES 2003-2004). Serum 25-(OH)D values were available for 15,994 participants. VitD Def was defined by criteria based on 1) studies of bone health, 25(OH)D =11ng/mL; 2) studies of non-skeletal health, 25(OH)D <20 ng/mL. Persons with diagnosed diabetes were self-identified (n=1,468). Logistic regression was used to estimate odds ratios (95% confidence intervals [CI]) for the association between diabetes and Vit Def, controlling for age, sex, race/ethnicity, education, income and body mass index (kg/m^2). The models provided adjusted predictive marginal probabilities of Vit Def. Differences were considered significant at P-values <0.05
Results: Persons with diagnosed diabetes had a nearly 2-fold higher odds of having VitD Def than those without: for serum 25(OH)D =11 ng/mL, unadjusted OR=1.88 (95% CI, 1.53-2.31), adjusted OR = 1.37 (95% CI, 1.13-1.66)(p<0.01 for both). For serum 25(OH)D <20ng/mL, ORs were of similar magnitude (p<0.01 for both). After adjustment, prevalence estimates for VitD Def among persons with and without diagnosed diabetes were: 9% vs. 7% overall, 6% vs. 3% for nonHispanic whites and 17% vs. 11% for Mexican Americans (P<0.01 for each). Prevalence was highest among nonHispanic blacks (28% vs. 31%) but did not differ by diabetic status (p>0.05). Prevalence was higher using 25(OH)D <20ng/mL but showed similar patterning.
Conclusions: Regardless of how defined, diagnosed diabetes was positively associated with increased risk of VitD Def among non Hispanic whites and Mexican Americans but not among African Americans. The implications of these findings for the health of people with diabetes require further investigation.

No conflict of interest

D-0738

Expression of mitochondrial Hsp60 in blood monocytes isolated from type 2 diabetes mellitus patients

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Aims: The objective of this study was to assess if long-term exposure to Metformin results in significant changes to the expression and secretion of Hsp60 (a mitochondrial specific stress protein) from blood Monocyte cells.
Methods: Peripheral blood mononuclear cells (PBMC) were isolated from Type 2 Diabetes Mellitus patients attending the Waikato Regional Diabetes Clinic. A total of ten patients were selected. Five were being treated on Metformin (500mg) and five patients were being managed on diet and exercise. All patients had been diagnosed within the past 2 years and were selected on the following criteria: non-smokers, not subjected to treatment by Statins, anti-inflammatory drugs or calcium beta-blockers.
Monocyte cells were isolated by percoll gradient centrifugation and checked for purity by morphological criteria and surface expression of CD14 by immuno cytochemical analysis.
Expression of Hsp60 was determined by RT-PCR and normalised to the house keeping gene GAPDH
Results: We show for the first time that at mRNA level the expression of mitochondrial Hsp60 is significantly higher in primary monocyte cells from Type 2 DM patients being treated on Metformin (500mg) compared to patients being managed on diet and exercise. The HbA1c levels (range 5.9% to 8.4%) at time of blood collection for the Monocyte assays were similar for both cohorts, indicating that the levels of Hsp60 expression seen in Monocyte cells was unlikely to be related to changes in glucose homeostasis.
Conclusions: Metformin is known to be an inhibitor of complex 1 of the mitochondrial respiratory chain. Since the expression of Hsp60 is an indicator of mitochondria stress, our results suggest that long-term use of Metformin (via Hsp60 expression) may indeed exacerbate mitochondrial related processes already compromised in diabetic patients.

No conflict of interest

D-0739

Decreased blood level of glyoxalase I activity and diabetic complications

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Background: The formation of advanced glycation endproducts (AGEs) has been recognized as an important pathophysiological mechanism in the development of diabetic complications. Production of methylglyoxal (MG), a cytotoxic and crosslinking aldehyde, is elevated among patients with T2DM and is a precursor to (AGEs). The ubiquitous glyoxalase system is one of several defense systems designed to metabolise MG and to protect against the production of AGEs. It is composed of two enzymes, glyoxalase I (GloI) and glyoxalase II (GloII) and reduced glutathione (GSH) as an essential cofactor. GloI catalyzes the conversion of MG to D-S-lactoylglutathione by a GSH-dependent reaction and GloII catalyzes the hydrolysis of D-lactoylglutathione into D-lactate. A dysfunction of the glyoxalase system will result in accumulation of the highly reactive MG.
Aims: The present study was conducted to explore the hypothesis that the reduction of GloI activity may be associated with diabetic complications.
Methods: The activity of the GloI and the content of GSH were measured in blood samples of 150 controls and 172 subjects with T2DM from the North of

Morocco (35 with nephropathy, 25 with retinopathy, 18 with neuropathy, 33 with arteritis of lower limbs, 5 with cerebral vascular accident, 20 with cardiac complications and 36 uncomplicated). The GloI protein level was also examined by electrophoresis and western blot analyses. We evaluated the relationships between these levels and the pathogenesis of micro- and macrovascular complications of diabetes.

Results: There were significant decreases in the activity of GloI and GSH level between diabetic patients and controls. The reduction was more pronounced in diabetic patients with complications than the uncomplicated subjects. The GloI protein level, assessed in blood extract by electrophoresis and western blot analyses, was markedly lower in a diabetic patient with nephropathy and another with retinopathy than that observed in an uncomplicated patient and a normal subject.

Conclusions: This study provides evidence for elevated concentrations of MG and AGEs in T2DM which might have pathogenic significance and reflected the lower detoxification level of the glyoxalase system in subjects with chronic complications of T2DM.

No conflict of interest

D-0740

Diltiazem inhibits apoptosis of vascular smooth muscle cells (VSMC) exposed to high glucose concentration through lectin-like oxidized low density lipoprotein receptor-1 (lox-1) pathway

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Objectives: To know the effect of diltiazem on the apoptosis of VSMC exposed to high glucose through inhibition of LOX-1 expression.

Method: The research approved by Ethical Commission of Faculty of Medicine, informed consent was assigned by the subjects. We performed experimental study on the primary culture of VSMCs. The arterial VSMCs isolated from the umbilical cord, prepared based on the method of Maasch in 18 well-plate. After confluence in the sixth subculture VSMCs in the first 6 wells were incubated in the media + 5 mM glucose, in the second 6 wells incubated in the media + 25 mM glucose, both for 6 days, and in the third 6 wells VSMCs were pretreated with diltiazem 10μM for 30 minutes, before incubation in the media + 25 mM glucose + diltiazem (10μM final concentration) for 6 days. Intracellular Ca^{++} concentration measured by Fluo-3 staining observed with an argon confocal microscope (Olympus FV-1000). The intensity of fluorescence were observed in the region of interest (ROI). Fluorescent signal from samples quantified by FV10-ASW 1.7 software embedded on Olympus FV-1000. Expression LOX-1, and Caspase-3 activity (a key regulatory protease at which many signaling pathways merge for the execution of apoptosis) was measured by Elisa. Data were expressed as mean ± SEM. The statistical significance was assessed by one-way analysis of variance (ANOVA) followed by post hoc analysis by Tuckey test. $p < 0.05$ was considered statistically significant.

Results: Several studies proved the role of LOX-1 in cell apoptosis in high glucose environment. Chronic exposure to high glucose concentration (25 mM), increases cytosolic Ca^{++} concentration (3127 ± 413.89 v/s 2011.81 ± 410.93 unit/cell, $p < 0.01$), expression of LOX-1 ((506.80 ± 10.47 v/s 458.40 ± 36.49 ng/ml, $p < 0.05$), and caspase-3 activity (129.98 ± 5.97 v/s 114.73 ± 10.84 %, $p < 0.05$) in VSMCs, compared with exposure to 5mM glucose concentration. LOX-1 was related to caspase-3 activity, pre-treated with inhibitor LOX-1 activity, k-carragenan before exposed to glucose 25 mM, prevents the increasing of caspase-3 activity (96.41 ± 5.11 v/s 129.98 ± 5.98 %, $p < 0.01$). Pre incubation with 10μM of diltiazem before exposure to 25 mM glucose concentration significantly inhibits the elevation of cytosolic Ca^{++} concentration (2149.61 ± 339.49 v/s 3127 ± 413.89 unit/cell, $p <0.01$), and LOX-1 expression (468,60 ± 14.44 v/s 506.80 ± 10.47 ng/ml, $p < 0.05$), and caspase-3 activity (82.50 ± 9.90 v/s 129.98 ± 5.97%, $p < 0.01$).

Conclusion: The results demonstrate that high glucose induces VSMCs apoptosis through LOX-1 and caspase-3 pathway. This effect appears to be inhibited by diltiazem through the decreases of cytosolic Ca^{++} concentration, LOX-1 expression and caspase-3 activity.

No conflict of interest

D-0741

Blood serum nucleic acids level increased in diabetes mellitus

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Aims: Diabetes mellitus (DM) are complex disease and involve many parts of tissue damage in pathogenesis. The nucleic acids in blood serum (SNA) are detected in very small amount in healthy subjects and are increased in some disorders. The aim of this study was an investigation of the level of SNA in DM2 patients and its relationship with glycemic control.

Materials and methods: In 32 DM2 patients and 9 healthy subjects SNA level, fasting (FG) and 2 hour after breakfast (2HG) glycemia, HbA1c, serum nitrites and nitrates (NN) level, CRP, erythrocytes sialidase activity (ESA) were measured and HOMA were calculated as (FG x fasting insulin): 22.5.

Results: Data analysis showed that in DM2 patients FG and 2HG were significantly increased in 1.9 and 2.1 time and HbA1c level was increased in 1.7 time, HOMA was increased in 2.7 time and indicated the poor glycemic control and insulin resistance in observed patients. ESA was increased in 9.1 time and indicate cell plasma membrane destabilization, and CRP level was increased in 1.6 times which suggest presenting of tissue damage and inflammation. NN levels were decreased in 2.1 time and indicated endothelium dysfunction in observed patients. In DM2 patients SNA level were increased in 2.3 time ($P<0.05$) than in healthy subjects. Increasing the SNA level shown positive correlation with FG ($r=0.4$) and 2HG ($r=0.48$), HbA1c ($r=0.3$) level and had linkage with HOMA, ESA, NN.

Conclusion: SNA levels are increased in patients with DM2 and shown positive correlation with glycemia indexes and had linkage with HOMA, NN, ESA and reflected tissue damage degree.

No conflict of interest

D-0742

Effect of Diabetes Mellitus on ovarian reproductive hormones and the enzymes required for their synthesis

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Aims: Diabetes has been reported to reduce fertility in females. However, the association between reduced fertility, reproductive hormones (progesterone, testosterone, estradiol) and steroidogenic enzymes (3b-hydroxysteroid dehydrogenase {3b-HSD}, 17ß-hydroxysteroid dehydrogenase {17b-HSD}, Aromatase {P450arom}) has not been exhaustively investigated. The aim of this study is to determine how diabetes affects these ovarian hormones and the enzymes required for their synthesis.

Materials and methods: Sixty female Sprague Dawley rats (250-300g) were selected from the Animal House, Faculty of Medical Sciences, University of the West Indies, Trinidad. Animal care was in accordance with the guidelines of the Laboratory Animal Committee of the Faculty. Diabetes was induced by a single intraperitoneal injection of streptozotocin (65mg/kg body weight) dissolved in sodium citrate buffer (pH 4.5). Control rats received physiological saline intraperitoneally. Rats with blood glucose levels of 250-600 mg/dl were considered diabetic. Humulin R (0.3I.U./kg body weight) was administered when necessary to maintain this diabetic glucose range for two months.

Ten animals in each group (control and diabetic) were anesthesized with diethyl ether. Their thoracic and abdominal cavities were exposed. Blood was aspirated intracardially from each rat for hormonal assay and the ovaries were dissected out for histochemical investigations.

Serum concentrations of progesterone, testosterone and estradiol were estimated using the *VITROS Eci* immunodiagnostic system (Ortho-clinical Diagnostics). Histochemical staining for the activities of 3b-HSD, 17ß-HSD and P450arom was carried out on the ovarian tissues.

The mean hormonal values of the experimental and control rats were calculated. The staining intensities of the enzymes were determined using Image J software. The statistical analyses of the respective means were determined using the paired T-test (Minitab 15), and their P-values determined at 95% confidence intervals.

Results: Results showed that the mean serum progesterone, testosterone and estradiol concentrations of 2-month-diabetic animals were 49.3%, 54.1%, and 49.0% respectively, when compared with the controls. The P-values for these hormones were 0.000, 0.003, and 0.000 respectively. The staining intensities for 3b-HSD, 17ß-HSD, and P450arom of experimental animals were 82.7%,

79.9%, and 89.7% respectively, when compared with controls. The P-values for the staining intensities for these enzymes were 0.014, 0.001 and 0.011 respectively.

Conclusion: We conclude that diabetes mellitus decreased the serum concentration of progesterone, testosterone and estradiol and that this was mediated through decreased activities of ovarian steroidogenic enzymes.

No conflict of interest

Complications - macrovascular 4

D-0743

Caspase-3 inhibition augments cardiac triglyceride accumulation after diabetes

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Impairment of cardiac glucose utilization after diabetes rapidly shifts heart metabolism to consumption of more fatty acid (FA), which can be provided by lipoprotein lipase (LPL). Protein kinase D (PKD) is a key element involved in increasing cardiac LPL after diabetes. We determined the mechanisms by which PKD is regulated in heart and adipose tissue following diabetes. STZ (100 mg/kg) was used to induce diabetes whereas Z-DEVD-fmk was employed to lower caspase-3 activity. In severely diabetic rats, in the presence of augmented circulating FA, cardiac LPL remained unchanged and was likely a consequence of caspase-3 cleavage of PKD. Nevertheless, hearts from these rats demonstrated higher plasma membrane CD36 (FA transporter), FA oxidation and triglyceride (TG) accumulation. Treating diabetic rats with Z-DEVD effectively lowered caspase-3 activity, prevented PKD cleavage and increased LPL vesicle formation and translocation to the vascular lumen. The increase in cardiac luminal LPL was associated with a striking accumulation of cardiac TG which was almost 2-fold higher than that in the untreated diabetic animals. This effect was unrelated to a further increase in CD36 but was correlated to a greater association between the lipid droplet and OXPAT, a lipid droplet binding protein. Adipose tissue from untreated diabetic rats had lower PKD phosphorylation, and treatment with Z-DEVD-fmk prevented this effect. Our data suggest that although caspase-3 inhibition in diabetes may increase TG accumulation in adipose tissue, when caspase-3 is inhibited in the heart, a potentially destructive lipid accumulation may induce heart dysfunction.

No conflict of interest

D-0744

The impairment of cerebrovascular reactivity in patients with diabetes mellitus

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Aims: Diabetes mellitus is associated with significantly increased risk of stroke and vascular dementia compared to the general population, independently of the classic risk factors. The impairment of cerebrovascular reactivity could be one of the underlying factors of such association. In this study we assessed cerebrovascular reactivity in patients with diabetes mellitus compared to healthy subjects.

Methods: We studied 20 patients with diabetes mellitus – 10 with type 1 (aged 32.6±3.8 years) and 10 with type 2 (aged 53.3±2.0 years) and 10 healthy subjects as controls (aged 41.4±3.3 years). The patients studied did not have a history of cerebrovascular diseases, occlusion of extracranial carotid arteries and did not take any medications affecting the cerebrovascular reactivity. The mean cerebral blood flow velocity by the medial cerebral artery was measured by transcranial dopplerography, and cerebrovascular reactivity was assessed using the breath-holding test (for 30 sec) and the cold test (application of the ice for 5 sec). The cerebrovascular reactivity was calculated by the difference of blood flow velocity before and immediately after the test expressed in percentage of the basal level.

Results: We found that an increase of cerebral blood flow velocity during breath-holding or cold tests was significantly attenuated in patients with diabetes (either type 1 or type 2) compared to the control group. The mean cerebral blood flow by the right medial cerebral artery after the breath-holding test was increased by 11.4±2.2%, 9.8±2.3% and 28.2±3.9% and by the left medial cerebral artery by 10.8±2.6%, 6.2±4.6% and 23.5±3.9% in patients with type 1, type 2 diabetes and healthy controls, respectively, $p<0.05$ for comparisons between subjects with and without diabetes. The cold test led to an increased blood flow by the right medial cerebral artery by 9.4±2.5%, 12.8±4.2% and 25.9±3.3% and by the left medial cerebral artery by 8.3±3.6%, 13.1±4.2% and 21.4±3.5% in those with type 1, type 2 diabetes and controls, respectively, $p<0.05$.

Conclusions: We may conclude that the cerebrovascular reactivity is significantly impaired in patients with diabetes mellitus, which could be one of the predisposing factors for stroke in these subjects.

No conflict of interest

D-0745

Role of intracellular zinc ion in diabetic cardiomyopathy

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Several Ca^{2+} binding proteins in cardiomyocytes bind Zn^{2+} suggesting that Zn^{2+} can modulate the structure and function of many proteins, which play important role in excitation-contraction coupling. It was also demonstrated that Ca^{2+} dependence of ryanodine binding to the sarcoplasmic reticulum of cardiac muscle is greatly affected by Zn^{2+}. Additionally, it was shown that transverse striations for high $[Zn^{2+}]_i$ localized and coincided with the I-band of cardiomyocytes. Evidence from animal models suggests that reactive oxygen species (ROS) play an important role in development of diabetic cardiomyopathy. Since free Zn^{2+} is altering function of numerous cellular proteins, its mobilization by ROS in diabetic heart can be likely to cause significant effects. It is highly likely that any mechanism that alters the concentration and distribution of intracellular free Zn^{2+} ($[Zn^{2+}]_i$) in cardiomyocytes will cause profound functional effects.

Therefore, in the present study, we focused first on the quantization of STZ-induced alterations of $[Zn^{2+}]_i$ in cardiomyocytes by using fura-2 and the metallothionein (MT) level of heart tissue. We also measured oxidation levels (levels of lipid peroxidation and nitric oxide products) as well as levels of antioxidants (superoxide dismutase, glutathione reductase, and glutathione peroxidase) of the heart tissue of STZ-induced diabetic rats. Second, a beneficial effect of selenium on diabetes-induced altered parameters of the heart was demonstrated. Diabetic rats were treated with sodium selenate (15 mmol/kg body weight/day) for 4-week. Our data showed that diabetes caused significant increases in basal $[Zn^{2+}]_i$ as well as basal $[Ca^{2+}]_i$ of cardiomyocytes, and also a significant increase in oxidized glutathione of the heart while decreasing the level of reduced glutathione, significantly. We also found that sodium selenite treatment of the diabetics markedly restored these altered parameters. Our data indicate that an oxidant shift of cellular thiolic pools can modulate $[Zn^{2+}]_i$ in diabetic heart.

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Conflict of interest:
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D-0746

Left ventricular diastolic function in type 2 diabetic patients with and without metabolic syndrome

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Aim: Diabetes mellitus and hypertension are risk factors for left ventricular (LV) diastolic dysfunction. Metabolic syndrome (MetS) is associated with the increased LV mass which induced LV diastolic dysfunction. There are few studies of the association between MetS and LV diastolic function without LV mass effects. The aim of our study is to evaluate the influence of MetS on LV diastolic function in type 2 diabetic patients.

Methods: Echocardiography was performed in 26 type 2 diabetic patients with MetS(14 men, age 53±11 yr, (mean±SD)) and compared with 26 type 2 diabetic patients without MetS (15 men, 53±10 yr) matched for age and sex. LV internal diameter was measured by M-mode echocardiography, and fractional shortening (FS) and LV mass were also calculated. LV mass was indexed by body surface area (LVMI) and body height to the power of 2.7. LV systolic function was assessed by FS, and LV diastolic function was assessed by the ratio between the peak diastolic velocity and the peak atrial systolic velocity (E/A) on the mitral inflow pulsed wave with doppler examination. MetS was defined, according to the Japanese criteria of 2005, as a waist circumference level >85 cm in men and >90 cm in women and two or three of the following

three risk factors: hypertension (a blood pressure level >130/85mmHg), dyslipidemia (an HDL cholesterol level <40 mg/dl or a TG level >150 mg/dl), and glucose intolerance (a fasting glucose level >110 mg/dl). Subjects taking medications for any of the three components were also considered to have the corresponding risk factor. In addition, we also measured visceral, subcutaneous and total fat areas at the umbilicus level using computed tomography. Fasting plasma glucose, HbA_{1c}, serum total cholesterol, triglycerides, HDL-cholesterol (HDL-C) and LDL-cholesterol were determined. Adipocytokines such as leptin, adiponectin, t-PAI-1 and IL-6 were measured. Insulin resistance was measured by fasting insulin. Atherosclerosis was evaluated through pulse wave velocity (PWV) and ankle-brachial index (ABI).

Results: E/A was significantly decreased in patients with MetS as compared to patients without MetS (0.91±0.21 vs. 1.10±0.35, p<0.05). Patients with MetS had elevated BMI (p<0.001), elevated BP (p<0.05), higher TG and HDL-C (p<0.01), increased LVMI (p<0.005), LVMI $^{2.7}$ (p<0.001), increased t-PAI-1 and leptin(p<0.01), and decreased adiponectin(p<0.005) as compared with patients without MetS. In type 2 diabetic patients with MetS, increased HbA1c, TG, BPs and PWV, and decreased adiponectin were independent risk factors for decreased E/A (p<0.05), after adjusted by LVMI.

Conclusions: MetS was associated with the decreased LV diastolic function in type 2 diabetic patients. Both factors of MetS and atherosclerosis may lead to LV diastolic dysfunction without the effect of LV hypertrophy in type 2 diabetic patients.

No conflict of interest

D-0747

Tight glycemic control can be achieved while avoiding severe hypoglycemia

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The optimal target range for blood glucose in critically ill patients is not known. Tight glycemic control has been supported by numerous randomized and observational studies. Recent studies, however, have reported excessive rates of severe hypoglycemia and increased mortality. The initial response from the ADA/AACE/Endocrine Society is to compromise by accepting levels that previously were associated with increased complications.

Glucommander™ is a computerized system for advising insulin dosing to achieve any desired BG target with very limited hypoglycemia. When BG does drop insulin is phased out while nutrition continues and carbohydrate intake is augmented with D50.

The experience shows that out of 6323 runs in 17 hospitals the incidence of BG below normal range was:

	n	Patients with 1 or more BG's<=40 mg/dl	Patients with 1 or more BG's<=60 mg/dl	Mean ± sd
NICE-SUGAR	3034	6.8%		115±18 mg/dl
Glucommander				
Version 4	3095	0.3%	7.5%	121±31 mg/dl
Surg ICU	238	zero	7.7%	103±19 mg/dl
Med ICU	79	2.9%	42.0%	102±26mg/dl
G+	2911	2.0%	15.7%	107±13mg/dl
All Glucommander	6323	1.1%	11.7%	

Version 4 Glucommander--Version used since 1992

Surg ICU: CV Surgery study by authors.

Med ICU: Multicenter medical ICU study.

G+: A commercial version of Glucommander. Data from 11 hospitals not supervised or coached by inventors.

The rate of severe hypoglycemia with the Glucommander is significantly lower that those reported by Leuven SICU (5.2%) and MICU (18%), NICE-SUGAR (6.8%), VISEP (17%), and Arabi (28.6%).

A computer controlled algorithm for managing IV insulin with: 1) alarms for prompting BG measurement at varying intervals, 2) the ability to calculate insulin adjustments to prevent excursions outside the target range, and 3) a system to dictate controlled glucose correction, is mandatory to stabilize glucose levels in a optimal safe range.

Now is the time to implement tight glycemic control in any institution. We propose that near normoglycemia in ICU setting be performed with a more effective and safe computer controlled system.

Conflict of interest:
Stock ownership: Davidson, Bode, Hebblewhite, Booth, Grady: Glucotec stock
Advisory board: Davidson, Bode, advisors to Glucotec
Employee: Booth, Grady, employees of Glucotec

D-0748

Glycemic control, antiplatelet therapy and blood coagulation activity in diabetes

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Background and aims: Macroangiopathy (MA) such as cerebral infarction, myocardial infarction is a common cause of death in diabetes. These complications are thought due to increased coagulation activity. To evaluate an accurate blood coagulation activity which responds to treatments, we measured blood coagulation in diabetes using free oscillation rheometer.

Materials and methods: Blood was obtained from human adult volunteers including normal (N: n=52) and diabetic patients (DM n=56). Blood coagulation was measured by free oscillation rheometer (FOR). Blood was taken from healthy volunteers using 3.8% tri-sodium citrate solution as an anticoagulant. The blood was immediately transferred into a polypropylene tube which is attached to a torsion wire. The cup was initially rotated about its longitudinal axis and released. Change in logarithmic damping factor (LDF) was monitored after adding 0.085mL $CaCl_2$ solution to anti-coagulated blood sample. This LDF value is closely related to the viscosity and viscoelasticity of blood sample in the vascular model tube. The onset time of coagulation (Ti) and the slope of coagulation curve (SCC) were determined. Plasma glucose(PG), HbA1c, LDL-cholesterol(C), triglyceride, hematocrit, platelet count, s-creatinine, plasma fibrinogen and urine protein were measured at the same time.

Results: Ti from N or DM group were 34.6±9.0 (min: mean±SD) and 43.2±22.3, respectively. This rheometer detected erythrocyte sedimentation phenomenon (ES) from 23 DM patients. The Ti showed significant negative correlation with HbA1c levels (r=-.359, p<0.01) or LDL-C levels (r=-.313, p<0.05). The SCC showed significant negative correlation with Ti (r=-.302, p<0.05), and showed positive correlation with PG (r=0.381, p=0.005) or HbA1c (r=0.269, p<0.05). Table1 shows SCC, PG, HbA1c, LDL-C and Fibrinogen levels in each groups.

Table 1.

Ti and ES	SCC	PG(mg/dL)	HbA1c(%)	LDL-C (mg/dL)	Fibrinogen (mg/dL)
Shortened with ES+	.0049±.0031	236±87	9.6±2.6	150±58	478±92
Prolonged with ES+	.0037±.0014	195±104	7.5±1.4	111±29	348±111
Shortened with ES-	.0037±.0030	220±151	8.6±2.5	134±29	334±73
Prolonged with ES-	.0022±.0011	140±54	7.3±1.9	118±44	345±97

Twelve patients took antiplatelet drug. Table 2 shows Ti, SCC, PG, HbA1c and LDL-C in diabetics with or without antiplatelet therapy.

Table 2.

	Ti(min)	SCC	PG(mg/dL)	HbA1c(%)	LDL-C(mg/dL)
Antiplatelet therapy+	59.62±2.9	.0033±.0013	171±113	7.1±0.88	108±32
Antiplatelet therapy-	39.9±21.6	.0039±.0025	208±106	8.4±2.1	125±39

Conclusion: Free oscillation rheometer revealed the deterioration of whole blood coagulation and erythrocyte sedimentation phenomenon, and also the contribution of platelets to coagulation which responds to treatments. These observations show that rheological technique may have a significant impact on the assessment of coagulation parameters, such as Ti and SCC, and glycemic control is important on blood coagulation in diabetes.

No conflict of interest

D-0749

Effects of oxidized or glycated LDL on mitochondrial respiration chain activity and enzymes in arterial endothelial cells

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Elevated low density lipoprotein (LDL) is a classical risk factor for atherosclerotic cardiovascular disease. Increased levels of oxidized LDL (ox-LDL) and glycated LDL (gly-LDL) were detected in diabetic patients. Our previous studies demonstrated that ox-LDL and gly-LDL increased the generation of reactive oxygen species (ROS) in vascular endothelial cells (EC). ROS is implicated in endothelial dysfunction and diabetic vascular complications. Mitochondria are an important source of ROS in the body. We hypothesize that ox-LDL or gly-LDL might affect the activity of mitochondrial respiratory chain. We evaluated the activities of mitochondrial respiratory chain complexes in porcine aortic EC (PAEC) using oxygraphy. The oxygen consumption in Complex I, II and IV of PAEC was significantly decreased by 12 or 24 h of incubation with ox-LDL or gly-LDL compared to control cultures. Ratio of NAD+/NADH (Complex I) and the activities of succinate-ubiquinone oxidoreductase (Complex II), ubiquinone cytochrome c oxidoreductase (Complex III) and cytochrome C oxidase (Complex IV) in EC were significantly reduced by treatment with ox-LDL or gly-LDL. Increased ROS in EC induced by ox-LDL or gly-LDL was associated with mitochondrial marker in EC. The findings suggest that attenuated mitochondrial activity in vascular EC may contribute to ROS generation induced by atherogenic lipoproteins.

No conflict of interest

Experimental approaches to the treatment of type 1 diabetes

D-0750

An engineered rat liver cell line H4IIEins/ND reverses diabetes in mice

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Gene therapy is a promising strategy being explored to correct blood glucose concentrations in patients with Type 1 diabetes. One approach is delivery of beta cell transcription factors to the liver to induce the generation of insulin-producing cells. In the current study, we used a bicistronic retroviral vector to deliver either the human insulin gene alone or the human insulin gene and the rat *NeuroD1* gene to the rat liver cell line H4IIE to determine if storage of insulin and pancreatic transdifferentiation occurred. Stable clones were selected and expanded into cell lines: H4IIEins cells (insulin gene alone), H4IIE/ND (*NeuroD1* gene alone) and H4IIEins/ND (insulin and *NeuroD1* genes). The H4IIEins/ND cells (10^7) were subsequently transplanted subcutaneously into diabetic NOD/Scid mice to examine if the cells could reverse diabetes.
Radioimmunoassay of acid/ethanol cellular extracts indicated that H4IIEins cells did not store insulin. However, H4IIE/ND and H4IIEins/ND cells stored 65.5±5.6 and 1,475.4±171.8 pmol insulin per $5x10^6$ cells (n=5), respectively. Unlike the parent cell line or H4IIEins cells, several beta cell transcription factors (*Pdx1, NeuroD1, Nkx2.2, Nkx6.1*) and pancreatic hormones (insulin 1 and 2, glucagon, somatostatin, pancreatic polypeptide) were expressed in both H4IIE/ND and H4IIEins/ND cell lines. The pancreatic exocrine factor p48 was not present in any of the engineered liver cell lines. Transmission electron microscopy revealed the presence of large numbers of storage vesicles in the H4IIEins/ND cell line. Granules were of a similar size and appearance to those seen in pancreatic beta cells. Regulated secretion of insulin in response to increasing concentrations of glucose (0-20 mM) was seen only in the H4IIEins/ND cell line. The glucose response curve of the H4IIEins/ND cell line was near physiological; insulin secretion commenced in the presence of 2.5mM glucose. Transplanted cells coalesced into a reddish friable mass at the site of grafting and grew slowly. The blood glucose levels of all 9 diabetic mice that were transplanted became normal, 5.6 ± 0.1 mM, in 5-10 days after the cells were implanted. Removal of the grafts at 21 days resulted in a prompt increase in the blood glucose levels to hyperglycaemic values, 17.9 ± 4.2 mM. Our results suggest that expression of *NeuroD1* together with insulin may be a useful strategy for inducing islet neogenesis and reversing diabetes without exocrine differentiation.

No conflict of interest

D-0751

Towards development of a non-rejectable islet allograft using local expression of indoleamine 2, 3 dioxygenase

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Aims: Success of transplantation of pancreatic islets as a promising therapeutic method for restoring efficient insulin regulation in type 1 diabetes mainly depends on lifelong use of immunosuppressive drugs. Adverse side effect of immunosuppressive agents commonly used after transplantation is a source of major concern not only for islet cell recipients but also for physicians, caregivers and researchers. With the goal of eliminating the necessity of systemic immunosuppressive agents after islet transplantation, in this study we developed and applied a novel non-rejectable islet graft through employing a local immunosuppressive factor, indoleamine 2, 3 dioxygenase (IDO). This idea is adapted from the natural mechanism, which protects the fetus in a mother's uterus from being rejected by her body's immune system during pregnancy. In fact, endogenous IDO has been implicated as one mechanism that helps maintain maternal tolerance toward the fetus. IDO is a tryptophan degrading enzyme and functions as a potent immunomodulatory factor.
Methods: We engineered a three-dimensional composite islet graft equipped with IDO expressing bystander cells as local immunosuppressive system. In this composite graft, expression of IDO in syngeneic fibroblasts by using an adenoviral mediated gene transfer method provided a low tryptophan microenvironment within which T-cells could not proliferate and attack islets. Composite islet grafts consisting of allogeneic mouse islets and syngeneic IDO-expressing fibroblasts embedded within collagen gel matrix were prepared and transplanted into renal subcapsular space of immunocompetent streptozotocin induced diabetic mice. The graft function and criteria for graft take were then assessed.
Results: IDO expressing Islet allografts survived and functioned significantly longer than controls (41.2±1.64 vs. 12.9±0.73 days, $p<0.001$). Allogeneic islets remained intact and functioning in IDO-expressing grafts without administering systemic immunosuppressive agents for more than six weeks. Histological examination of the grafts showed that IDO evidently prevented lymphocyte infiltration into allografts. T-cells densely accumulated in the border of IDO-expressing grafts and kidney tissue but didn't penetrate the composite grafts. Furthermore, production of donor specific alloantibodies was significantly delayed in IDO group.
Conclusion: This promising finding proves the potent local immunosuppressive effect of IDO in islet allografts and sets the stage for development of a long-lasting non-rejectable islet allograft using stable IDO induction in bystander fibroblasts.

No conflict of interest

D-0752

Strategies to improve encapsulated islet survival and oxygenation

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The microencapsulation of pancreatic islets is a promising treatment for type 1 diabetes. Although microcapsule biocompatibility has improved, islet cell survival is still problematic. During islet isolation, the extracellular matrix (ECM) around the islet is destroyed, which negatively affects islet function and survival. Also, smaller islets have been shown to have better function and survival. Since encapsulated islets are not re-vascularized, their oxygen supply is entirely dependent upon diffusion. The use of dispersed islet cell re-aggregates of smaller diameter now allows the investigation of microcapsules of further reduced size.
Aim: The aim of this study is to improve microencapsulated islet cell survival, using three approaches: restoring the ECM loss, reducing the microcapsule diameter from 300 µm to ~ 100 µm, and reducing the islet diameter, using islet cell re-aggregates. It is known that dissociated islet cells have the capacity to re-assemble in clusters that have the same properties as a normal islet. The first steps were to 1) characterize ECM in islets, after isolation and encapsulation, 2) produce islet cell re-aggregates and 3) evaluate the feasibility of producing 100-150 µm diameter microcapsules.

Methods: The presence of ECM molecules (collagen I and IV, fibronectin and laminin) was evaluated by immunohistochemistry in islets that were cultured for different time periods, comparing encapsulated to non-encapsulated islets. Secondly, islet-like clusters were formed after dissociation of islets with trypsin and rotational incubation during 5-6 days. Different conditions were tested to achieve an optimal size. Finally, alginate-poly-L-lysine microcapsules were produced using an electrostatic pulse generator, and different fabrication parameters were tested in order to achieve specific capsule diameters.
Results: Collagen IV and laminin were found to be present in whole pancreases used as a control, but only a minimal amount was found in isolated islets for all of the tested conditions. The other proteins under study were present for all conditions(fibronectin, collagen I). Islet-like clusters were produced and encapsulated in small microcapsules. We were able to produce microcapsules with a diameter of 132,32 ± 6,29 µm by extruding alginate through a 30G needle and reducing the alginate flow rate from 3,5mL/min to 0,3mL/min.
Discussion/conclusion: This data suggests that replacing collagen IV and/or laminin in the re-aggregates might be useful. We also showed the feasibility of producing APA microcapsules of approximately 130 µm and of encapsulating islet cell re-aggregates within these microcapsules. Further research will be conducted to determine whether the use of this system improves oxygen supply to islets and islet survival.

No conflict of interest

D-0753

Co-transplantation of neural stem cells and pancreatic islets improves graft endocrine function in athymic mice

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Aims: Despite improvements in clinical islet transplantations long-term graft failure still represents a major problem. One possibility to achieve better results could be co-transplantation of islets with other cell types, which through the release of growth factors, could promote beta-cell growth and graft endocrine function. The aim of this study was to investigate, in an experimental system, if co-transplantation of neural stem cells and islets would lead to differentiation of the stem cells and whether this could improve insulin release from islet grafts.
Methods: Mouse islets and mouse neural stem cells were transplanted alone (150 of each) or together (75 of each) beneath the right and left renal capsule, respectively, of athymic mice. One month post-transplantation the grafts were removed and perifused with medium containing low (2.8 mmol/l) and high (28 mmol/l) glucose concentrations. Perifused grafts were then removed and stained for insulin, beta-tubulin and neuron subtype markers.
Results: Most of the neural stem cells differentiated to glial and neuronal cells. Despite the fact that only half the number of islets was used when co-transplanted with neural stem cells, compared with islets alone, the insulin release from the grafts was similar in the perifusion experiments. The beta-cell volume in the grafts was also similar in islets transplanted alone or in combination with neural stem cells.
Conclusions: Co-transplantation of neural stem cells and pancreatic islets improved graft endocrine function. This could be mediated through neurotrophic factors, released from differentiated neural stem cells. This opens new possibilities to improve post-transplant islet graft function.

No conflict of interest

D-0754

Preservation of human islet function in vitro through EMC reestablishment

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Pancreatic islet transplantation requires successful isolation and *in vitro* survival; however, studies have shown that islet isolation exposes the islet to a variety of cellular stresses, destroys the basement membrane (BM) and disrupts the cell-matrix relationship, leading to apoptosis. In the current state of islet regeneration research, we are still unable to re-emulate the ECM conditions of the pancreatic islet and restore the BM which is lost during isolation. The rationale behind this research study is to identify factors responsible for islet preservation and survival *in vitro*. This will lend to emulate the basement membrane of native islet tissue through proper cell-substrate interactions.
This study has shed light into important factors that promote human islet adhesion, morphology, survival and functionality *in vitro*. A direct relationship was observed between surface roughness and wettability of the modified protein surfaces. Also, the AFM analysis showed a homogeneous distribution of the proteins on their respective surfaces. Fibronectin, followed by laminin, possessed the greatest contact angle and surface roughness which directly correlate with hydrophobicity.
Adhesion studies showed that collagen I, collagen IV, and fibronectin surfaces were the most effective in inducing adhesion at levels of over 50%. Also, islets cultured on these surfaces showed high metabolic activity and viability. Islet morphology was maintained best on fibronectin surfaces, while being most compromised on collagen I due to islet spreading and monolayer formation. However, the strongest adhesion occurred on collagen I, followed by collagen IV and fibronectin. Furthermore, glucose-induced insulin release was optimal for fibronectin cultured islets, in contrast to its ECM counterparts. Islet gene expression of insulin, glucagon, somatostatin, pancreatic polypeptide and PDX1 were also elevated relative to islets cultured on BSA-control surfaces. This investigation into appropriate surfaces for islet adhesion and viability provides valuable insight into the optimal conditions to ensure islet survival *in vitro*. More importantly, this forms the basis for further experiments investigating the effects of geometry of the surfaces on adhesion, viability, and differentiation; as well as the implementation of a favourable microenvironment for isolated pancreatic islets.

No conflict of interest

D-0755

Understanding the biocompatibility of microcapsules designed for islet cell transplantation

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The microencapsulation and transplantation of islet cells is a very promising approach to effectively treat insulin-dependent diabetes mellitus. To encapsulate islets, most research groups use alginate as the base material and then incorporate a polycation into the capsule membrane.
Problematic: The biocompatibility of microcapsules designed for islet transplantation remains difficult to control, predict and reproduce. This has the effect of limiting the long-term function of the graft.
Aim: The purpose of this work is to explain the biological response to alginate-based microcapsules in terms of their fabrication design and surface properties.
Methods: Microcapsules are made using different alginates (Alg I or Alg II) and have either no polycation, poly-L-lysine (PLL), or poly-L-ornithine (PLO) incorporated into the membranes. Alg I is composed of 37% guluronic acid (G) while Alg II is composed of 58% G, as confirmed by nuclear magnetic resonance. To evaluate their biocompatibility *in vivo*, microcapsules are implanted into the peritoneal cavity of C56BL/6 mice for 2 days and then immune cell adhesion to the explanted capsules is measured using a semi-quantitative scoring system with a scale of 0 to 2. Films that recreate the microcapsule structure are analyzed in terms of chemical composition using x-ray photoelectron spectroscopy and Fourier transform infrared spectroscopy. Film hydrophilicity is evaluated using various methods to measure the contact angle at the water/air/surface interface.
Results: In the absence of a polycation, Alg I capsules were almost free from cellular adhesion after 2 days implantation (score 0.05 ± 0.01) while Alg II capsules were often covered with immune cells (score 1.02 ± 0.03). This difference in biocompatibility was significant ($p < 0.001$). Yet, alginate hydrophilicity was similar, as water droplets on dry films had contact angles of 38.7 ± 1.7° and 39.0 ± 1.3° for Alg I and Alg II, respectively. When PLL was added to the capsule membrane, the immune response was more severe ($p < 0.01$), as cell adhesion scores increased to 1.11 ± 0.11 for Alg I and to 1.55 ± 0.07 for Alg II. Similarly, the cell adhesion score increased to 0.49 ± 0.06 when PLO was added to Alg I capsules, indicating a non-significant increase in capsule immunogenicity. A comparison of contact angles of water on dry films containing polycations was not possible due to irregular surfaces and complete wetting. We are currently measuring the contact angles of air bubbles on hydrated films.
Conclusions: The guluronic acid content of alginate has a significant effect on its biocompatibility *in vivo*. Incorporating polycations into the membranes of alginate microcapsules lowers their biocompatibility. So far, these results cannot be explained by the hydrophilicity of the samples.

No conflict of interest

Foot care 2

D-0756

Efficacy and safety of recombinant human platelet-derived growth factor gel for diabetic neuropathic foot ulcers: a systematic review

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Aims: To assess the efficacy and safety of recombinant human platelet-derived growth factor (rhPDGF) gel for diabetic neuropathic foot ulcers.
Methods: We searched MEDLINE, EMBASE, OVID Evidence-Based medicine Reviews(Cochrane DSR, ACP Journal Club, DARE, and CCTR), China National Knowledge Infrastructure (CNKI) and VIP database to July 2008 for randomized controlled trials (RCTs). Meta-analyses were performed with the Cochrane Collaboration's RevMan 4.2 software.
Results: Six RCTs involving 1181 patients were included. Meta-analyses showed that, compared with controls, patients treated with rhPDGF at 100 ug/g had a significantly increase in complete healing rate [RR 1.36, 95%CI (1.16, 1.58)], while patients with rhPDGF at 30 ug/g didn't show an increased rate [RR 1.38, 1 95%CI (0.76, 2.50)]. rhPDGF gel (100 ug/g) is likely to decrease the time to complete healing and reduces the size of the ulcer more effectively. Moreover, rhPDGF gel does not cause apparent adverse effects and is relatively safe for use.
Conclusions: The currently available evidence indicated that rhPDGF gel can increase complete healing rate of neurogenous diabetic foot, shorten the time of complete healing and be helpful to shrink ulcer surface. rhPDGF gel has no apparent adverse effects.

No conflict of interest

D-0757

Role of modified total contact cast (window walking cast) in healing of diabetic plantar surface ulcers

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Background: Dr Paul Brand was the first to widely use Total Contact Cast (TCC) in the mid 1960's to offload the insensate foot in Hansen's disease. It has since then been identified as a gold standard for offloading Diabetic Foot Ulcers (DFU's) within the Diabetic Foot-care community.
This study was designed to assess the effectiveness of a method to offload large neuropathic DFUs. The device used is modified TCC with a MCR insole inside the cast and window around the ulcer.
Aim: This study reports our experience with Modified Total Contact Cast with a window in healing of non-infected neuropathic plantar ulcers as compared to standard TCC.
Materials and methods: Thirty two patients of Diabetic Foot Ulcer (DFU) incolving plantar surface of more than 2 * yrs duration (6 months – 5 yrs) subjected for offloading technique (TCC) after Vibration Perception Threshold (VPT), Ankle Brachial Index (ABI) and X-Ray evaluation.
Twelve patients in Control group (7 male & 5 female, having average age of 49.5 yrs (37 yrs-65 yrs), average HbA1c of 9.6% (8%-10.5%) were given TCC following the standard technique, and twenty patients in Study group (11 male & 9 female, having average age of 48.2 yrs (36 yrs-63 yrs), average HbA1c of 9.7% (7.8% - 11.3 %) were given TCC with MCR Insole inside the plaster cast and window was made for observation and regular dressing.
Results: In control group with standard TCC (without window and MCR insole) the average healing time was 8 weeks (6-20 weeks) while in the study group it was 5.6 weeks (4 – 16 weeks). Foul smell from cast was observed in control group. Four cases of cast damage/breakage occurred in control group and one case of cast damage / breakage occurred in study group. Frequency of change of cast was 2 weeks in control group and 3-4 weeks in study group.
Conclusion: Modified TCC (TCC with MCR insole and window around the ulcer) is an effective technique in healing of non infected neuropathic plantar ulcers for the following reasons:
1. It is not removable and does not depend on patient compliance.
2. The window around the ulcer allows for drainage of ulcer and daily wound care.
3. Requires less frequent change of cast
4. If needed growth factors can be applied.
5. Cost effective

No conflict of interest

D-0758

Bacterial etiology and drug resistance profile of diabetic foot infections in North India

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Aims: To determine the bacteriological profile, antibiotic susceptibility patterns of organisms isolated from diabetic foot ulcers (DFU) and establish the predictors of multidrug-resistant organisms (MDROs) and outcome of these infections.
Methods: Bacteriological culture and antibiotic sensitivity profiles were carried out from 154 type 2 diabetic patients admitted with DFU with Wagner's grade 1-5. Twenty four (15.6%) patients had coexisting osteomyelitis. Gram-negative bacilli were tested for extended spectrum ß lactamase (ESBL) production by double disc diffusion method. Staphylococcal isolates were tested for methicillin resistance by using 1-µg oxacillin disc.
Results: Gram negative aerobes were most frequently isolated (81.6%) followed by Pseudomonas. The highest ESBL production was noted in P. aeruginosa (32.8%), followed by E. coli (27.5%) and K. pneumoniae (23.7%). In the multivariate logistic regression model: duration of infection >1month, prior antibiotic use and ulcer size >4cm^2 were independently associated with risk of MDRO infection.
Conclusions: Infection with MDROs was common in diabetic foot ulcers and presence of PVD, past history of amputation, ulcer size, a higher Wagner grading, duration of infection and duration of hospital stay were the factors more likely to be associated with adverse clinical outcome.

See table 1: Antimicrobial susceptibility pattern of isolated bacteria

No conflict of interest

D-0759

Secular trends in foot ulcer disease among persons with diabetes: Dar es Salaam, Tanzania, 1997-2008

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Background: Lower limb complications in persons with diabetes are associated with substantial morbidity and mortality in Tanzania. Previous reports suggest an epidemiologic linkage between large vessel disease (LVD) and foot ulcer pathogenesis.
Objectives: We carried out these analyses to establish secular trends in the incidence rates of diabetic foot ulcer disease in Tanzania during 1997-2008 (study period).
Methods: We reviewed foot ulcer data aggregated by the Tanzania Diabetic Ulcer Surveillance System (TANDUSS). These data reflect persons with diabetes who were hospitalized in Muhimbili National Hospital (MNH) in Dar es Salaam. Factors assessed include demographics, and occurrence of LVD, peripheral neuropathy (PN), and neuro-ischemia (NI). Ulcer incidence was expressed as a % of all persons with diabetes presenting to MNH with any foot problem during study period.
Results: Of 4,324 diabetes patients admitted to MNH during study period, 736 (17%) had foot ulcers. Of these 736 patients, 511 (69%) were male and 718 (97%) were of African ethnicity. During study period, trends of PN remained upward whereas LVD and NI decreased over the study period to <1% in 2008. Ulcer incidence rates peaked at 24% in 2005 and then fell in parallel with LVD and NI to 8% in 2008.
Conclusion: PN rates continue to increase among persons with diabetes in Tanzania. Incidence rates of foot ulcer disease have been on a downward trend since 2005 and parallel the fall in LVD and NI rates. The epidemiologic linkage and public health implications of these findings remain unascertained.

No conflict of interest

Table 1: Antimicrobial susceptibility pattern of isolated bacteria

Antimicrobial agent(µg)	Staphylococcus aureus	*Proteus* spp	Escherichia coli	Klebsiella pneumoniae	Pseudomonas aeruginosa	*Acinetobacter* spp
n	80	40	102	76	122	10
	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)
Methicillin sensitive	58(72.5)	†	†	†	†	†
Methicillin resistant	22(27.5)	†	†	†	†	†
Vancomycin resistant(30)	12(15)	†	†	†	†	†
Erythromycin(15)	10(12.5)	†	†	†	†	†
Clindamycin(2)	20(25)	†	†	†	†	†
Chloramphenicol(30)	64(80)	†	†	†	†	†
Cotrimoxazole(1.25/23.75)	16(20)	†	†	†	†	†
Nitrofurantoin	66(82.5)	†	†	†	†	†
Linezolid	78(97.5)	†	†	†	†	†
Fusidic acid	74(92.5)	†	†	†	†	†
Tetracycline(30)	16(20)	4(10)	20(19.61)	14(18.42)	20(16.39)	0(0)
Ciprofloxacin(5)	16(20)	32(80)	50(49.02)	38(50)	66(54.09)	8(80)
Levofloxacin	16(20)	32(80)	60(58.82)	40(52.63)	66(54.09)	8(80)
Gatifloxacin(5)	18(22.5)	34(85)	60(58.82)	44(57.89)	68(55.74)	8(80)
Amkacin(30)	42(52.5)	14(35)	64(62.74)	48(63.16)	88(72.13)	6(60)
Gentamicin	36(45)	10(25)	50(49.02)	36(47.36)	34(27.86)	2(20)
Tobramicin	30(37.5)	8(20)	52(50.98)	36(47.36)	46(37.70)	2(20)
Cefalothin	*	8(20)	40(39.22)	26(34.21)	40(32.79)	2(20)
Cefazolin	*	8(20)	40(39.22)	28(36.84)	42(34.42)	2(20)
Cefuroxime	*	10(25)	44(43.14)	30(39.47)	68(55.74)	4(40)
Cefoxitin	*	12(30)	44(43.14)	32(42.10)	68(55.74)	4(40)
Cefaclor	*	10(25)	42(41.18)	30(39.47)	64(52.46)	4(40)
Ceftazidime	*	14(35)	50(49.02)	38(50)	70(57.38)	6(60)
Cefotaxime	*	14(35)	52(50.98)	38(50)	70(57.38)	6(60)
Ceftriaxone	*	14(35)	50(49.02)	36(47.37)	70(57.38)	6(60)
Cefoperazone	*	14(35)	58(56.86)	34(44.74)	72(59.02)	6(60)
Cefepime	*	18(45)	66(64.71)	54(71.05)	74(60.66)	8(80)
Piperacillin	*	12(30)	22(21.56)	10(13.16)	72(59.02)	4(40)
Amoxyclav	†	14(35)	62(60.78)	46(60.53)	74(60.66)	6(60)
Piperacillin/Tazobactam	†	22(55)	70(68.63)	54(71.05)	90(73.77)	6(60)
Ampicillin/Sulbactam	†	24(60)	68(66.67)	50(65.79)	96(75.41)	6(60)
Imipenem	†	40(100)	102(100)	76(100)	122(100)	10(100)

*staphylococci resistant to oxacillin have been considered resistant to all beta lactams
† Not tested

D-0760

Effect of percutaneuous transluminal angioplasty in patients with diabetic foot ulcer and ankle-brachial pressure index above 0.9

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Background: According to International Consensus on the Diabetic Foot, Doppler ankle/brachial index (ABI) below 0.9 indicates peripheral arterial disease (PAD). There is little information in the literature to guide subsequent vascular intervention in a patient with foot ulcer and ABI above 0.9. The relationship between ABI prior to percutaneous transluminal angioplasty (PTA) and PTA outcomes is not conclusive. The aim of our study was to compare clinical effect of PTA in terms of TcPO2 (transcutaneous oxygen pressure) changes and ulcer healing in patients with ABI equal or above 0.9 and ABI below 0.9 prior to PTA.

Patients and methods: The retrospective study was conducted to evaluate 55 lower limbs in 53 diabetic patients (mean age 64±11 years, mean diabetes duration 20±11 years, 45 M/8 F) treated at a foot clinic. All patients underwent PTA in 2006-2008 and Doppler assessment was documented. Indication for angiography and subsequent PTA were non-healing diabetic foot ulcers with suspected ischaemia based on complex vascular assessment (mainly TcPO2). The mean follow up period was 10 (8 -12) month. Retrospectively, in the first group lower limbs with ABI equal or above 0.9 were included and in the second group lower limbs with ABI below 0.9 were included. Evaluation of PTA clinical effect was based on TcPO2 changes measured one week after PTA and on ulcer healing – ulcer healing defined as ulcer closure or below-the ankle amputation healed, and healing failure as non- healed ulcer or above- the -ankle amputation.

Results: In the first group (ABI equal or above 0.9) 26 lower limbs and in the second group (ABI below 0.9) 29 lower limbs were evaluated. Using Wagner classification the groups were comparable in severity of lesions; both groups did not differ significantly in the mean TcPO2 prior the PTA (23.7±15.6 vs 23.6±15.6 mmHg, NS). There was significant increase of TcPO2 after PTA both in the first (11.5±18.4 mmHg, p= 0.0035) and the second group (13.8±12.6 mmHg, p<0.001) with no significant differences between both groups. No significant difference between first and second group in clinical outcomes during the follow up period was observed: ulcer healing in 20/26 vs 20/29 (77% vs 69%, NS) and healing failure in 6/26 vs 9/29 (23% vs 31%, NS).

Conclusions: Our study demonstrated no significant differences in the effect of PTA between patients with ABI equal or above 0.9 and in patients with ABI below 0.9. We concluded, that patients with non-healing ulcers can benefit from vascular intervention (PTA) even if ABI above 0.9, which cannot reliably exclude PAD in diabetic patients.

No conflict of interest

D-0761

Presentation of diabetic foot ulcer and its outcome at a tertiary care unit in Karachi – Pakistan

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Objective: To study the presentation and risk factors determining the outcome of diabetic foot ulcer at a tertiary care unit.
Methods: We have characterized the presenting features, grade of foot ulceration, risk factors for ulceration and lower extremity amputation (LEA) in 1246 diabetic subjects presenting with foot ulceration from January 2004 to December 2008 at a tertiary care unit in Karachi, Pakistan. Screening for other complications of diabetes and metabolic assessment was also done according to standard guidelines.
Results: Seventy percent of the subjects were male with mean age of 53.52 ± 10.99 years. Majority of the subjects (51.60%) had UT Grade 1 ulceration followed by UT Grade 3 in 26.5% and UT Grade 2 in 13.4% respectively. 35.23% subjects completely healed without LEA while 9.63% subjects required LEA. 24.23% subjects are currently under treatment and 30.4% subjects were either referred to government setup or they left against medical advice (LAMA). Previous history of ulceration was present in 42.5% subjects. The risk of LEA was significantly associated with the UT grade and stage of ulceration at presentation along with increasing age. Foot care practices were followed by only 19.02% of the study population while cause of diabetic foot ulcer was not declared by 58.4% of the subjects. Regarding the type of foot ulcer, 58.10% subjects were having neuropathic ulcer, 40.12% subjects were having neuro-ischemic and pure ischemic ulcers were seen in only 1.28% subjects. Majority (94%) of the subjects were having poor glycaemic control i.e.HbA1c>7 while 72% subjects were having BP> 130/80. Retinopathy and nephropathy was present in 67% and 56% subjects respectively while 11% subjects were having diagnosed CAD.
Conclusion: The outcome of ulceration was determined by the severity and grade of foot ulceration at presentation. Effective foot care advice should be propagated at primary care level to the patients to reduce the burden imposed by diabetic foot complication, particularly in developing countries.

No conflict of interest

D-0762

The study on mechanisms of epidermal keratinocyte migration impaired by glycated matrix

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Background and aims: Diabetes mellitus is one of the most common disease in human life. Many kinds of complications caused by diabetes metabolism disorder and its metabolite, including nonhealing wound, now is becoming a difficulty in clinical treatment and academic research. Keratinocyte is the main repair cell participating wound healing, whose migration function is the base of wound re-epithelization. Keratinocyte continuously migrates on the wound edge, while wound size reduces to complete healing. If keratinocyte migration is blocked, then it means that the wound can't heal. So the study of keratinocyte migration behavior is of profound significance for exploring the rule of wound healing. This study is to discuss that keratinoctye migration is impaired by glycated matrix and its mechanism.
Methods: Keratinocytes from six male Sprague-Dawley rats' back, cultured for two to three generations, were used for experiments. Glycated laminin model were made by laminin cultured in glycolaldehyde and AGEs concentrations were assessed by detecting total fluorescence in glycated laminin model and immunohistochemistry assay. Keratinocytes were cultured on glycated laminin and normal laminin as study group and control group respectively. Keratinocyte migration was measured by scratch wound healing assay. Adhesion rate was expressed by Optical Density(OD), determined with MTT assay. Keratinocyte morphology was observed by scanning electron microscopy and inverted microscope. F-actin was observed by immunofluorescence. Integrina3 was determined by flow cytometry.
Results: The amount of migrating keratinocyte in study group is significantly less than control(13±4/HP vs 61±11/HP, P<0.05), which confirmed that keratinocyte migration was obviously inhibited by glycated matrix. There was no difference of adhesion rate between study group and control group(12h OD: 0.102±0.014 vs 0.134±0.062; 24h OD: 0.181±0.050 vs 0.187±0.061,P>0.05), however the morphology of keratinocyte on glycated laminin indicates that the cell body was small and hardly spread compared with that on normal laminin. Microfilament of the keratinocyte on the glycated laminin was sparsely distributed in the cytoplasm and around cell nuclear, but the expression of microfilament in the control group was intensively and distributed on the cell membrane, especially on the free edge. The expression of keratinocyte integrina3 on normal laminin is significantly higher than that on glycated laminin(11.23±5.27% vs 36.58±11.24%, P<0.05).
Conclusions: Keratinocyte migration is inhibited by the glycated laminin. The reason behind the phenomenon is possibly that integrin signaling disorder leads to decrease of integrin and actin expression, followed by the drop of lamellipodia and filopodia development, and the ultimate consequence would be the contribution to the restrained migration.

No conflict of interest

D-0763

A comparative study of outcomes of patients with diabetic foot lesions managed with an off-loading device

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Background: Foot ulcers in persons with diabetes are the leading cause of non-traumatic lower limb amputation in Tanzania; recent data indicate such ulcers are more likely due to infection rather than neuropathy or vascular disease. Unlike developed nations, where off-loading devices have proven effective in ulcer healing, there are no published data that demonstrate the effectiveness of such devices among diabetes populations in Africa.
Objectives: To determine the utility of a locally made shoe as an off-loading device in the management of foot ulcers among persons with diabetes who attend Muhimbili National Hospital (MNH) diabetes clinic.
Methods: During Sept 1995 through Dec 2005 (study period), consecutive adult diabetes patients with foot ulcers were evaluated and enrolled after informed consent. Detailed clinical and epidemiologic data were recorded and patients were randomly given custom-made off-loading shoes according to the site of the foot ulcer. We followed up patients in the MNH clinic to document progress and outcomes.
Results: Of 885 patients enrolled during the study period, 589 (66%) were male, 660 (75%) were African (vs. 16% Asian), 861 (97%) had type 2 diabetes, 762 (86%) had peripheral vascular disease, 763 (86%) had peripheral neuropathy, and 129 (15%) were fitted with custom-made shoes. All patients received at least one course of antibiotics. The median age and body mass index was 54 (range: 14-98) years and 24.8 (range: 14-45) kg/m^2, respectively. Forty-four (5%) patients died from causes attributed to complication from their foot ulcer. The median time to healing was 49 days. On multivariate analysis using logistic regression, independent correlates for total healing of ulcers were female sex ($p < 0.01$), age <50 ($p < 0.001$), sloughectomy ($p < 0.01$), or tissue loss grade ($p < 0.01$).
Conclusion: In conclusion, we did not document any significant advantage in using a locally made shoe to achieve total healing of foot ulcers in our study population, even among patients with severe ulcers. Adjunct surgery, antibiotics, and education focused on targeted groups of patients appear to be playing a major role in achieving total healing of ulcers.

No conflict of interest

D-0764

Moxifloxacin use in complex treatment of neuroischemic form of diabetic foot with collateral blood flow

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Aim: to evaluate moxifloxacin influence (avelox, Bayer Schering Pharma) on the results of surgical treatment of patients with neuroischemic form of diabetic foot (DF) with collateral blood flow.
Methods: In 2007-2008 40 patients with neuroischemic form of DF with collateral blood flow in the main and comparison groups were treated. In these DF groups with collateral blood flow, patients with toe gangrene prevailed – 62.5 % in each group. In the main group complex treatment included avelox – daily 400 mg intravenously within 2 days, then the same dose perorally within 5 days; but in comparison group a third generation cephalosporin was administered alongside with aminoglucoside and metronidazole within 7 days.
Results: In the main group with collateral blood flow 40 operations were performed: 4 necrectomies, and as a result of complication 1 extremity amputation was done at the level of shin upper one-third, 8 phlegmon openings (1 amputation at the level of shin upper one-third), 8 toe amputations in our clinic modification with secondary suture during the second phase of wound process (1 amputation at the level of hip middle one-third), 20 transmetatarsal amputations (2 amputations at the level of hip middle one-third). In comparison group 40 operations were performed: 3 necrectomies (1 extremity amputation at the level of shin upper one-third), 8 phlegmon openings (2 amputations at shin level), 8 toe amputations in our clinic modification with secondary suture during the second phase of wound process (2 amputations at the level of shin upper one-third), 21 transmetatarsal amputations for toe gangrene (2 amputations at the level of hip middle one-third and 1 amputation at the level of shin upper one-third).
Conclusion: Reliable improvement of surgical treatment results of patients with neuroischemic form of DF with collateral blood flow took place after complex therapy that included 400 mg of avelox daily within 2 days intravenously, then perorally the same dose within 5 days.

No conflict of interest

Oral agents in type 2 diabetes (1)

D-0765

Efficacy of dapagliflozin in three populations of patients on different treatment regimens for various stages of T2DM

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Aims: Dapagliflozin, a novel oral antidiabetic to treat T2DM, blocks renal glucose reabsorption by selectively inhibiting sodium-glucose co-transporter 2. We compared 3 dapagliflozin trials of patients with inadequate glycemic control at different T2DM stages reflected by their regimens: 1) drug-naïve; 2) metformin; or 3) insulin + insulin-sensitizers (IS). Dapagliflozin, with its insulin-independent action, would be anticipated to work equally well regardless of T2DM stage and background medication.
Methods: Data were derived from 3 double-blind, placebo-controlled trials. Drug-naïve (Study 008): This 12-wk study randomized 389 drug-naïve patients to placebo (PBO), 2.5, 5, 10, 20, or 50 mg dapagliflozin, or metformin 750 mg titrated to 1500 mg. Metformin (Study 014 ST): This 24-wk study randomized 546 patients on metformin =1500 mg to PBO, 2.5, 5, or 10 mg dapagliflozin, plus open label metformin. Insulin+IS (Study 009): This 12-wk study randomized 71 patients on insulin (=50 U/d) + IS (metformin +/or thiazolidinediones) to PBO, 10, or 20 mg dapagliflozin, plus baseline IS and 50% baseline insulin.
Results: The mean T2DM duration, baseline and mean change from baseline for HbA1c, FPG, and weight are presented in the **Table**. Dapagliflozin was efficacious regardless of T2DM stage and background medication. Dapagliflozin produced continuous, progressive weight loss, and lowered glycemia without significant hypoglycemia. AEs were generally balanced, with similar SAE rates in all arms and no deaths. Dapagliflozin did not appear to impact UTI incidence. A trend of higher genital infection incidence was observed with dapagliflozin vs PBO.
Conclusion: Regardless of T2DM stage and background medication, dapagliflozin, as an insulin-independent agent, was efficacious in early stage drug-naïve patients, mid stage patients on steady-dose metformin, and late stage patients on complex insulin-based regimens.

Dapagliflozin Trials	HbA1c (%)	FPG (mg/dL)	Weight (kg)
Drug-naïve: 12 Wk (n=389) Mean T2DM duration 1.6–2.5 y			
Baseline mean range	7.6 - 8.0	142 - 153	86 - 91
Change from baseline at wk 12§ (LOCF)*			
Dapagliflozin (mg)			
2.5	-0.71	-16	-2.7
5	-0.72	-19	-2.5
10	-0.85	-21	-2.7
20	-0.55	-24	-3.4
50	-0.90	-31	-3.4
PBO	-0.18	-6	-1.2
Metformin 750/1500 mg	-0.73	-18	-1.7
Metformin: 24 Wk (n= 546) 125 Mean T2DM duration 5.8–6.4 y			
Baseline mean range	7.9 - 8.2	156 - 169	85 - 88
Change from baseline at wk 24§ (LOCF)*			
Dapagliflozin (mg)			
2.5	-0.67	-18	-2.7
5	-0.70	-22	-3.7
10	-0.84	-24	-3.4
PBO	-0.30	-6	-1.0
Insulin+IS: 12 Wk (n=71) Mean T2DM duration 11.3–13.8 y			
Baseline mean range	8.3 - 8.5	156 - 167	101 - 103
Change from baseline at wk 12§ (LOCF)*			
Dapagliflozin (mg)			
10	-0.61	2	-4.4
20	-0.69	-10	-4.2
PBO	0.09	18	-1.9

LOCF, last observation carried forward. PBO, placebo. IS, insulin sensitizer.
* Adjusted mean change from baseline for HbA1c, FPG.
§ Adjusted mean % change from baseline for weight.

Conflict of interest:
Paid lecturing: V. Woo: GlaxoSmithKline, Bristol-Myers Squibb, Novo Nordisk, Eli Lilly and Company, Merck C.J. Bailey: Bristol-Myers Squibb, GlaxoSmithKline, Merck Sharp & Dohme, Novo Nordisk, Eli Lilly and Company
Stock ownership: A. Bastien, L. Ying, J.F. List: Bristol-Myers Squibb
Advisory board: V. Woo: GlaxoSmithKline, Bristol-Myers Squibb, Novo Nordisk, AstraZeneca J.P. Wilding: AstraZeneca/Bristol-Myers Squibb C.J. Bailey: AstraZeneca/Bristol-Myers Squibb, GlaxoSmithKline, Merck Sharp & Dohme, Takeda, Novo Nordisk
Employee: A. Bastien, L. Ying, J.F. List: Bristol-Myers Squibb
Commercially-sponsored research: V. Woo: Bristol-Myers Squibb, Boeringher Ingelheim J.P. Wilding: AstraZeneca/Bristol-Myers Squibb

D-0766

Incidence of urinary tract infections and of genital infections in two T2DM populations cotreated with dapagliflozin and oral antidiabetics +/- insulin

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Aims: Epidemiological data show higher rates of urinary tract infections (UTIs) and genital infections in T2DM patients vs the general population. Both rates increase with poor T2DM control, T2DM duration, and treatment complexity. Infection risks are reported to increase as patients move from no treatment, to oral antidiabetics, to oral/insulin combinations. The etiologies of UTIs and genital infections in T2DM patients have not been confirmed, but poor glycemic control

and glucosuria are believed to be contributing factors. Dapagliflozin, a novel insulin-independent oral antidiabetic, pharmacologically induces glucosuria (2-3 g/h) to lower glycemia. By inhibiting sodium-glucose co-transporter 2, dapagliflozin modulates renal glucose reabsorption to promote urinary glucose excretion. We compared UTI and genital infection rates after adding dapagliflozin to regimens of T2DM patients who had inadequate glycemic control with regimens of either metformin or insulin+insulin-sensitizers (IS).

Methods: Data were analyzed from 2 double-blind, placebo-controlled trials. Metformin (Study 014 ST): This 24-week study randomized 546 patients on stable-dose metformin =1500 mg to placebo (PBO), 2.5, 5, or 10 mg dapagliflozin, plus open-label metformin =1500 mg. Insulin+IS (Study 009): This 12-week trial randomized 71 patients on insulin (=50 units/d) plus IS (metfomin +/or thiazolidinediones) to PBO, 10, or 20 mg dapagliflozin, plus baseline IS and 50% baseline insulin.

Results: Insulin+IS Study patients had T2DM longer than Metformin Study patients (mean 12.3 years vs 6.1 years, respectively), and higher baseline HbA1c (mean 8.4% vs 8.1%, respectively). All dapagliflozin arms showed glycemic efficacy; adjusted mean changes in HbA1c from baseline ranged from -0.67% to -0.84% (Metformin Study) and -0.61% to -0.68% (Insulin+IS Study). **UTIs**: Metfomin Study patients had similar UTI rates: 4.4–8.1% (dapagliflozin) vs 8.0% (PBO). One patient (4.2%) in the Insulin+IS Study on dapagliflozin 20 mg reported UTI compared to none on PBO or dapagliflozin 10 mg. **Genital Infections**: In the Metformin Study, genital infection rates were 5.1% (PBO) vs 8.0–13.1% (dapagliflozin arms). In the Insulin+IS Study, 1 patient (4.3%) on PBO reported genital infection, none on dapagliflozin 10 mg, and 5 (20.8%) on dapagliflozin 20 mg.

Discussion: Dapagliflozin pharmacologically induces controlled glucosuria to lower hyperglycemia. Despite adding dapagliflozin to different T2DM treatment regimens, UTI rates in this series of patients were similar for PBO and dapagliflozin. A trend of potentially higher genital infection incidence was observed for dapagliflozin vs PBO. These data suggest that glucosuria does not increase the risk of UTI in T2DM patients, but may increase the risk of genital infections. Additional investigation is needed to further elucidate the relationship of glucosuria to these different risks.

Conflict of interest:
Stock ownership: A. Bastien: Bristol-Myers Squibb A. Gomez Caminero: Bristol-Myers Squibb, GlaxoSmithKline L Ying: Bristol-Myers Squibb J.F. List: Bristol-Myers Squibb
Employee: A. Bastien: Bristol-Myers Squibb A. Gomez Caminero: Bristol-Myers Squibb L. Ying: Bristol-Myers Squibb J.F. List: Bristol-Myers Squibb A. Gomez Caminero: Bristol-Myers Squibb

D-0767

JNJ-28431754/TA-7284, an inhibitor of sodium glucose co-transporter 2, reduces body weight gain in zucker fatty rats

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Aims: Inhibition of sodium glucose co-transporter 2 (SGLT2) activity significantly increases urinary glucose excretion, which in turn reduces blood glucose levels. JNJ-28431754 (JNJ1754), an inhibitor of SGLT2 that has been used experimentally in diabetic and obese rodent models, not only lowers blood glucose levels but also results in a significant reduction of body weight gain, accompanied by a decreased feed efficiency index. To explore the potential mechanisms of JNJ1754 on body weight control, a study was conducted on Zucker Fatty (ZF) rats.

Methods: Male ZF rats (n=96 for total of study) fed with different diets (n=24 for each diet) (regular chow, high-fat, high-protein, or high-sucrose diets) were treated with vehicle or JNJ1754 3 mg/kg for 21 days, with or without pair-feeding to the vehicle group (n=8). Body weight, food consumption, blood glucose, body fat/lean mass, and energy expenditure were determined after 21 days of treatment.

Results: The total amounts of Kcal intake for vehicle-treated ZF rats were similar regardless of the different composition of fat, protein, or carbohydrate in the diet. Although JNJ1754 treatment significantly increased urinary glucose excretion, it did not significantly increase food consumption among the different diets. However, a marked decrease of body weight gain was observed in ZF rats fed with regular chow (-14.1%, $P<0.05$), high-fat diet (-10.9%, $P<0.05$), or high-protein diet (-17.2%, $P<0.05$). In ZF rats fed with a high-sucrose diet, JNJ1754 treatment resulted in a trend for less body weight gain (-7.6%). Indirect calorimetry determination showed that there was a significant decrease of respiratory quotient in ZF rats treated with JNJ1754, regardless of the different dietary composition, suggesting an increase of fatty acid oxidation in these rats. The 24-h energy expenditure (VO2 value) was not significantly different between vehicle- and compound-treated groups. In addition, there was a 10-16% reduction of the epididymal fat pad weight in compound-treated rats, although this reduction did not reach statistical significance.

Discussion/conclusion: SGLT2 inhibition in rats significantly increased urinary glucose excretion, which was associated with decreased body weight gain and changes in energy metabolism profile as demonstrated by increased fatty acid oxidation. This effect on body weight loss seems not to be influenced by the nutritional components in the diet. Further studies are needed to investigate if other factors beyond lipid mobilization also participate in the body weight control effect of SGLT2 inhibitor treatment.

Conflict of interest:
Employee: Yin Liang, Tonya Martin, and Keith Demarest are employees at Johnson & Johnson

D-0768

JNJ-28431754/TA-7284, an inhibitor of sodium glucose co-transporter 2, ameliorates diabetic syndrome in the ZDF rat

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Aims: Inhibition of sodium glucose co-transporter 2 (SGLT2) activity significantly increases urinary glucose excretion (UGE), which in turn reduces blood glucose levels. JNJ-28431754 (JNJ1754), an inhibitor of SGLT2, has been used experimentally in Zucker Diabetic Fatty (ZDF) rats to examine its effect on diabetic syndrome.

Methods: Male ZDF rats (10-11 wks of age, body weight ranging from 325-375 g) were used in the experiments. These ZDF rats were grouped based on their fed blood glucose levels (n=8 in each group) and treated with vehicle or with either a single dose of JNJ1754 or multiple doses for 4 weeks. The major pharmacologic end points included blood glucose levels in fed and fasted conditions, oral glucose tolerance test (OGTT), UGE, and plasma insulin levels as well as pharmacokinetics.

Table 1

Group	Time after a single-dose administration (h)							
	0	2	4	6	10	24	30	34
	Blood glucose levels (mg/dL)							
Vehicle	423±51	397±40	450±47	435±43	363±38	463±43	455±51	418±43
JNJ1754, 1 mg/kg	454±19	298±4	321±23*	323±19*	263±22*	393±23	410±28	329±17
JNJ1754, 3 mg/kg	434±24	236±26*	254±26*	242±23*	201±17*	303±22*	321±36*	260±21*
	JNJ1754 plasma levels (ng/mL)							
JNJ1754, 1 mg/kg	NA	64.5±21.2	347±184	431±134	62.8±24.7	59.9±27.0	7.30±0.0	ND
JNJ1754, 3 mg/kg	NA	507±84.7	1134±186	937±51.0	737±149	503±276	258±93.6	ND

NA=not applicable; ND=not determined.
*$P<0.05$.

Results: JNJ1754 showed a significant antihyperglycemic effect in ZDF rats that received a single dose of compound (Table). This blood glucose-lowering effect lasted for >34 hr, even if the compound was undetectable in the circulation. In the OGTT, JNJ1754 at 1 mg/kg also significantly increased UGE (191±12 mg/24 h vs 63±10 mg/24 h in the vehicle group, P<0.05) and resulted in a 17±3% reduction of blood glucose AUC vs vehicle-treated rats (P<0.05). A 4-week treatment with JNJ1754 3 mg/kg significantly decreased fed blood glucose levels to 248±14 mg/dL (vs 598±18 mg/dL in the vehicle group, P<0.01), reduced HbA1c to 7.1±0.3% (vs11.5±0.3% in the vehicle group, P<0.01), with an improved insulin release response to glucose challenge (155±12% increase vs vehicle group, P<0.05).

Discussion/conclusion: SGLT2 inhibition in ZDF rats significantly increased UGE, which ameliorated hyperglycemia and reduced HbA1c in these diabetic rats. Improved blood glucose control also enhanced insulin release response to glucose challenge, suggesting an improved pancreatic beta-cell function in JNJ1754-treated rats.

See table 1 (page 260)

Conflict of interest:
Employee: Yin Liang, Keith Demarest and Tonya Martin are employees at Johnson & Johnson Pharmaceutical Research and Development

D-0769

Influence of ß-adrenoceptor antagonists on the hepatic and renal uptake of metformin mediated by organic cation transporters 1 (OCT1) and 2 (OCT2)

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Aims/methods: The uptake of drugs from the blood into hepatocytes and renal tubular cells is a key determinant for metabolism and elimination and may influence their hepatic and systemic plasma concentrations and, thus, pharmacological effects. Metformin, used for treatment of type 2 diabetes is taken up into hepatocytes and into renal tubular cells by the organic cation transporters 1 (OCT1) and 2 (OCT2), respectively. Since many patients with diabetes type 2 receiving metformin are concomitantly treated with ß-adrenoceptor antagonists, we tested whether ß-adrenoceptor antagonists can inhibit OCT1- and OCT2-mediated metformin transport. Using HEK293- and MDCKII cells stably expressing the uptake transporter OCT1 or OCT2 we analyzed, whether the ß-adrenoceptor antagonists bisoprolol, metoprolol, carvedilol, and propranolol inhibit the transport of OCT1- and OCT2 substrates 1-methyl-4-phenylpyridinium (MPP^+) and metformin.

Results: Neither bisoprolol nor metoprolol significantly inhibited the OCT1-mediated uptake of both MPP^+ and metformin. In contrast, a significant inhibition of the OCT1-mediated MPP^+ and metformin transport was observed for carvedilol und propranolol (IC_{50} carvedilol for MPP^+: 2.3 µM; IC_{50} carvedilol for metformin: 1.5 µM; IC_{50} propranolol for MPP^+: 8.6 µM; IC_{50} carvedilol for metformin: 8.3 µM).

Similarly, the OCT2-mediated uptake of MPP^+ was significantly inhibited by neither bisoprolol nor metoprolol, whereas a significant inhibition was observed for carvedilol und propranolol (IC_{50}: 26.3 µM and 67.5 µM, respectively). Moreover, all ß-adrenoceptor antagonists significantly inhibited OCT2-mediated metformin uptake (IC_{50} bisoprolol: 2.4 µM; IC_{50} carvedilol: 2.3 µM; IC_{50} metoprolol: 50.2 µM; IC_{50} propranolol: 8.3 µM). Low carvedilol concentrations were shown to stimulate OCT2-mediated metformin transport by 40%.

Conclusions: These in vitro results demonstrate that alterations of uptake transporter function by ß-adrenoceptor antagonists have to be considered as potential mechanisms underlying drug-drug interactions in the liver and kidney.

No conflict of interest

D-0770

Quick release bromocriptine (Cycloset™) a novel treatment for type 2 diabetes also demonstrates improvements in blood pressure

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Background and aims: Bromocriptine-QR (BQR), a unique quick release formulation of bromocriptine, a sympatholytic dopamine D2 receptor agonist, improves glycemic control in subjects with type 2 diabetes (T2D) when given once daily in the morning, primarily by reducing post-prandial hyperglycemia without increasing post prandial insulin. In a large randomized trial of subjects with T2D (Cycloset Safety Trial; CST), BQR therapy significantly reduced the cardiovascular event rate by 40%. In this secondary analysis, we investigated the impact of BQR on systolic and diastolic blood pressures (SBP and DBP, respectively).

Methods: The CST was a 52 week, placebo-controlled, randomized trial evaluating the safety and efficacy of BQR versus placebo in 3070 subjects with T2D. Subjects could alter concomitant blood pressure (BP) medications during the trial to manage hypertension. Two physicians blinded to treatment group assignment assessed changes in concomitant BP therapies. Between group differences in mean changes from baseline for SBP and DBP after 52 weeks on treatment were compared using t-test among A) the entire study population, B) subjects on at least one BP medication at baseline and without a change in number of BP medications, and C) subjects on a BP medication with baseline SBP of >130 mmHg and without a change in number of BP medications. Changes in categorical variables were assessed using chi square.

Results: The baseline mean SBP (130 mmHg) and DBP (77 mmHg) were similar in both groups. Fewer subjects randomized to BQR intensified BP therapies during the course of the trial. Fewer subjects randomized to BQR reported adverse events of hypertension (1.5%) compared to placebo (3.1%); p=0.003. Among group A, the mean SBP and DBP changes were -2.3 and -1.9 mmHg, respectively for BQR (n = 1219) compared to -0.6 and -0.9 mmHg, respectively for placebo (n = 732), (between group differences were significant; SBP p=0.03 and DBP p=0.02). For group B, the mean SBP and DBP changes were –2.6 and -2.2 mmHg, respectively for BQR (n =757) compared to –0.7 and –0.4 mmHg, respectively for placebo (n = 453), (between group differences were significant; SBP p=0.05 and DBP p=0.002). For group C, mean SBP and DBP changes were -10.5 and –4.3 mmHg, respectively for BQR (n =344) compared to –7.2 and –2.6 mmHg, respectively for placebo (n = 190), (SBP p=0.02 and DBP p=0.06).

Conclusion: BQR reduced blood pressure and adverse events of hypertension in subjects with T2D. Improvements in SBP and DBP among subjects taking BQR may have in part contributed to the 40% cardiovascular event rate reduction observed in this trial among subjects taking BQR. In addition to improving glycemic control, Bromocriptine-QR improves blood pressure in subjects with T2D.

Conflict of interest:
Employee: Richard E. Scranton, Anthony H. Cincotta, Micheal Erozki

D-0771

Associations between the use of oral anti-diabetic drugs and the risk of cancer in type 2 diabetes patients

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Aim: Epidemiological studies reported inconsistent associations between the use of thiazolidinediones and cancer in type 2 diabetes mellitus. We aim to explore the associations between oral anti-diabetic drugs (OAD) and the risk of cancer in Hong Kong Diabetes Registry.

Methods: The Hong Kong Diabetes Registry was established since 1995. All diabetes referred to the Prince of Wales Hospital in Hong Kong underwent comprehensive assessment based on the European DiabCare protocol. Outcome was censored on 30th July 2005 from the Hong Kong Hospital Authority Central Computer System and the Hong Kong Death Registry. From 1995 to 2005, 7920 diabetic patients were enrolled in the registry. Excluding type 1 diabetes, non-Chinese patients, known history of cancer and missing data, 6103 Chinese type 2 diabetes patients were enrolled in this analysis.

Results: The median age of the cohort was 57 years (25th to 75th percentile: 47 to 67 years) and 46% were female. The median duration of diabetes was 6 years (2 to 11 years) at enrolment. After a median follow-up of 4.91 years (2.81 to 6.98 years), 4.44% (n=271) developed incident cancer and the incidence rate was 9.21 (95% confidence interval: 8.12 to 10.30) per 1000 person-years. Diabetes who developed cancers were older, more likely to be smokers and drinkers, have longer duration of diabetes, higher systolic blood pressure, higher levels of urine albumin-creatinine ratio, lower estimated glomerular filtration rate and low density lipoprotein (LDL-C) level <2.8 mmol/L, and albuminuria and LDL-C ?3.8 mmol/L than those diabetes without these clinical and biochemical features. Diabetes with cancer were less likely to use gliclazide, metformin, rosiglitazone, statins and angiotensin receptor blockers compared to diabetes without incident cancer. After adjusted for age, sex, body mass

index, smoking and alcohol drinking status, the use of rosiglitazone, metformin and gliclazide (Hazard ratio: 0.16, 0.58 and 0.73 with p-value=0.0091, <0.0001, 0.0168 respectively) was associated with lower risks of cancer.

Conclusions: We observed a negative association between the use of rosiglitazone, metformin or gliclazide and the risk of incident cancer in Hong Kong Chinese type 2 diabetes patients.

No conflict of interest

D-0772

Long-term effects of metformin on endothelial function and inflammation in type 2 diabetes treated with insulin: a randomised, placebo-controlled trial

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Aims: Three out of 4 patients with type 2 diabetes will die from cardiovascular disease. Treatment with metformin reduces rates of cardiovascular morbidity and mortality in type 2 diabetes, possibly through improvements of endothelial function and/or reduction of low-grade inflammation. Therefore, we studied the effects of metformin on markers of endothelial function and low-grade inflammation in patients with type 2 diabetes.

Methods: 390 insulin-treated patients with type 2 were randomly allocated to either placebo or metformin. 277 subjects (= 72%) completed the trial. During a follow-up of 4.3 years, plasma samples were taken to measure markers of endothelial function (urinary albumin excretion, plasma levels of vWf, sVCAM-1, sE-selectin, t-PA and PAI-1) and markers of low-grade inflammation (plasma levels of CRP and sICAM-1). For each subject, each variable was expressed as standard deviation of difference from the population mean. Mean standard deviation scores (= z-scores) were calculated as:

- endothelial dysfunction z-score = {urinary albumin excretion + vWf + sVCAM-1 + sE-selectin + t-PA + PAI-1}/6
- inflammation z-score = {CRP + sICAM-1}/2.

Results: Metformin treatment versus placebo was associated with a decrease in vWf of 11% (-16 to -6; p<0.001); a decrease in sVCAM-1 of 5% (-8 to -3; p<0.001); a decrease in t-PA of 15% (-20 to -9; p<0.001); a decrease in PAI-1 of 21% (-31 to -9; p=0.001); and a decrease in the endothelial dysfunction z-score of 7% (-10 to -4; p<0.001). Changes in urinary albumin excretion and sE-selectin were not significant. Metformin treatment versus placebo was associated with a decrease in CRP of 17% (-31 to -1; p=0.036); a decrease in sICAM-1 of -5% (-8 to -2; p=0.004); and a decrease in the inflammation z-score of -5% (-10 to +1; p=0.074).

Conclusion: This is the first long-term randomized controlled trial showing that metformin treatment is associated with decreases in the plasma concentrations of vWf, sVCAM-1, t-PA, PAI-1, CRP and sICAM-1, reflecting an improvement of endothelial regulation of haemostasis (vWf), of leukocyte adhesion (sVCAM-1), and of fibrinolysis (t-PA and PAI-1), as well as a reduction of low-grade inflammation.

Conflict of interest:
Paid lecturing: Novo Nordisk - Merck, Sharpe and Dohme - Eli Lilly - Novartis
Advisory board: Novo Nordisk - Merck, Sharpe and Dohme
Commercially-sponsored research: Altana - E. Merck Serono - Lifescan - Novo Nordisk - Eli Lilly - Novartis - Merck, Sharpe and Dohme

D-0773

A PPAR-sparing insulin sensitizer is effective in type 2 diabetic patients without causing weight gain

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Background and aim: We have suggested that insulin sensitizing activity of the thiazolidinediones (TZDs) can be separated from their ability to activate the nuclear transcription factor PPARg. Since PPARg-driven transcription has been implicated in many negative effects of both TZD and nonTZD-related insulin sensitizers, a PPAR sparing analog might be expected to have a superior profile of activity. We hypothesized such a compound would exert beneficial pharmacology without causing plasma volume expansion and weight gain. We have previously identified PPAR-sparing analogs with similar insulin sensitizing pharmacology to pioglitazone in preclinical animal models. Here we directly compare the prototypical PPAR-sparing analog, Mitoglitazone™ (MSDC-0160), to pioglitazone hydrochloride (Actos®) in type 2 diabetic patients. MSDC-0160 is an isomer of a known pioglitazone metabolite,

Methods: A double bind, placebo and comparator-controlled phase IIA study was carried out in 76 type 2 diabetic patients at 12 US sites. MSDC-0160 (Mito) was given as two doses of bulk drug [90 mg (Mito1) or 220 mg (Mito2)] chosen to bracket exposures (AUC) predicted for pioglitazone and its active metabolites. Subjects were either drug-free or on a stable dose of metformin. Participants underwent a two week single blind placebo lead-in followed by four weeks of active double blind treatment and a one week follow-up. The primary endpoint was change in postprandial glucose determined by mixed meal tolerance tests.

Results: Mito was well tolerated and no serious adverse events were observed. Exposures of Mito and its metabolite were reached that should not be sufficient to activate PPARg. Both Mito2 and pioglitazone (Pio) significantly (p< 0.05 versus placebo) reduced circulating postprandial blood glucose, triglycerides, and free fatty acids. High molecular weight adiponectin was increased by 102 %, 223%, and 215% for Mito1, Mito2, and Pio, respectively. Both Pio and Mito2 produced a statistically significant time-dependent decrease in circulating fasting glucose (1.1 mM and 0.98 mM, respectively) and a statistically significant time-dependent increase in HDL cholesterol (0.119 and 0.130 mM, respectively). Over this short study period, Pio resulted in a small (1.14 kg), but statistically significant increase in weight gain that was not seen in the Mito-treated patients.

Conclusions: This study suggests that it is possible to achieve clinical responses with a non-PPAR activating thiazolidinedione similar to pioglitazone without the associated weight gain.

Conflict of interest:
Stock ownership: J.R. Colca, R.F. Kletzien, J.T. VanderLugt- Metabolic Solutions Development Company
Employee: J.R. Colca, R.F. Kletzien, J.T. VanderLugt- Metabolic Solutions Development Company
Commercially-sponsored research: Metabolic Solutions Development Company

Physical activity and exercise

D-0774

Glycemic control and exercise responses in type 1 diabetes mellitus athletes during 217km ultramarathon

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Aims: This study was designed to assess the glycemic control, intensity and duration of exercise, body weight and hematocrit of type 1 Diabetes Mellitus (DM1) athletes during 217 km relay ultramarathon.

Methods: It was studied a team composed by three DM1 athletes (35.3±0.9 years; 172.7±3.7 cm of height; 22.3±4.6 years of diagnosis; 14.3±0.9 years of race training; 40-140km/week of training volume) that participated in the "Brazil 217 Ultramarathon Relay". The total gain and loss of altitude during this 217km race were 10 and 9 km, respectively. The blood glucose was measured during the race (Roche Accu Check). The glycemic load of ingested food was also measured to adequate insulin infusion. Blood samples were obtained to hematocrit determination (Sysmex XS1000i) and body weight was assessed (Welmy) before and 5min after the race. One week before the competition and in subsequent days, the athletes individually determined the critical velocity (CV) from four maximal running in different distances (800, 1200, 1600, 2000m). So, the CV was determined by the angular coefficient of the linear fit of distance versus running time. The CV represents the aerobic capacity.

Results: The team completed the race in 29h28min at 3rd place in the competition. The relay was composed by six exercise bouts performed by each

athlete that ran a total of 72.3±6.0km each one. The exercise intensities for the first three and the last three bouts were significantly different (7.5±0.5 and 8.9±0.4 km/h, respectively; 54.2±4.1% and 64.9±3.0% of CV). The exercise time for each athlete at the first three bouts was 2h24min (±9min), longer than the last three exercise sessions (37min±7min). The glycemic values pre-race were in agreement with the position statement of American Diabetes Association, decreasing significantly during the first three bouts (238.9±36.1 vs 107.8±7.3; 166.3±20.7 *vs* 79.0±7.9 and 239.1±31.9 *vs* 83.8±5.7mg/dL). On the other hand, there was no significant differences between pre and post exercise in the three last bouts (258.0±31.0 *vs* 196.5±29.5; 231.0±3.0 *vs* 160.7±46.9 and 249.5±6.5 *vs* 186.0±46.4mg/dL), when the time of exercise was reduced and the intensity was increased significantly. The body weight (70.9±3.1 *vs* 68.6±3.4kg) and hematocrit (45.6±1.5 *vs* 48.1±2.0%) were not changed before and after race.

Discussion/conclusion: The data presented here have shown that DM1 athletes can participate in ultra-endurance races exhibiting high performance since glucose control is made along the race as an important management strategy to keep adequate blood glucose concentrations for physical activity (70-300mg/dL). This efficient control may have prevented the dehydration induced by glycosuria and polyuria, what can be observed by maintenance of body weight and hematocrit.

No conflict of interest

D-0775

High physical fitness is independently related to a better glycaemic control and cardiovascular risk profile in a type 2 diabetes cohort

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Aims: Physical activity is generally recommended in type 2 diabetes management. However, relatively few studies have evaluated its beneficial effects on metabolic control and complications development. The aim of this study was to investigate in a cross-sectional analysis the independent correlates of physical fitness of type 2 diabetic patients at entry into a cohort study.

Methods: 564 type 2 diabetic individuals were evaluated. Clinical, laboratory, echocardiographic and 24-hour ambulatory blood pressure (BP) monitoring data were recorded at baseline. Exercise capacity was self-reported by a standard questionnaire of daily activities and graded into 3 categories: low fitness (<4 MET), moderate fitness (4-7 MET) and high fitness (>7 MET). In a random sub-sample of 215 patients, physical fitness grades were confirmed by a conventional treadmill exercise test. Statistics included bivariate tests among the 3 categories (ANOVA and chi^2) and multivariate logistic regression with the lowest exercise capacity group as the reference.

Results: 180 patients (31.9%) had low exercise capacity, 217 (38.5%) moderate exercise capacity and 167 (29.6%) high exercise capacity. In comparison to the patients in the low-fitness group, patients with high exercise capacity were younger, more frequently males, and had lower body mass index and waist circumference. They had a lower prevalence of hypertension, lower office and ambulatory BP levels, most notably during the nighttime period, as well as a higher prevalence of the normal dipping pattern, and a lower left ventricular mass. Patients with high physical fitness had a lower prevalence of all micro or macrovascular degenerative complications. They also had lower mean fasting glycemia and HbA_{1c} during the first year of follow-up, but no differences in lipid profile, and a lower high-sensitive C-reactive protein levels at baseline. On multiple logistic regression, the high exercise capacity was independently associated with a lower likelihood of having peripheral arterial disease (OR: 0.26, 95%CI: 0.12-0.60), peripheral neuropathy (OR: 0.39, 95%CI: 0.21-0.73), cerebrovascular disease (OR: 0.25, 95%CI: 0.07-0.84), coronary artery disease (OR: 0.49, 95%CI: 0.24-0.99) and of being obese (OR: 0.41, 95%CI: 0.23-0.73); and with a higher chance of being male (OR: 1.97, 95%CI: 1.07-3.63), of having a lower mean fasting glycemia (< 7.8 mmol/l, OR: 1.95, 95%CI: 1.11-3.42), C-reactive protein (<3 mg/l, OR: 1.79, 95%CI: 1.03-3.10) and a lower nighttime pulse pressure (<51 mmHg, OR: 2.13, 95%CI: 1.22-3.71).

Conclusions: A high physical fitness is independently associated with a lower prevalence of diabetic complications and with a better metabolic glycemic control and cardiovascular risk profile.

No conflict of interest

D-0776

Preliminary analysis demonstrates winter reduction in daily steps and winter increase in blood pressure in type 2 diabetes

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Aims: Among adults with type 2 diabetes (T2D) in Montreal, we are seeking to objectively assess for reductions in walking volume in the winter and associated changes in glycemic control and blood pressure.

Methods: Observational cohort study involving 200 adults (T2D) recruited through McGill-affiliated clinics. All undergo one assessment per season over one year. Seasons are defined as winter (Dec-Feb), spring (Mar-May), summer (Jun-Aug), and fall (Sept-Nov). Assessments involve questionnaires, blood testing (A1C, Biorad II HPLC), and anthropometric measures. Participants are given three pedometers (viewing window concealed). They wear one for one week, the second for another week, and mail all three back to the study centre. The third serves to measure the false steps associated with mailing and delivery.

Results: Mean age is 61 years (SD 10), approximately 70% are White and slightly fewer than half born in Canada. Men and women are equally represented. Average diabetes duration is 9.5 years (SD 8; range 1 to 45 years) with a mean A1C of 7.6% (SD 1.5), mean blood pressure of 137 (SD 16)/81 (SD 11) mm Hg, mean BMI of 31 kg/m^2 (SD 6.0), and mean daily steps of 5,735 (SD 2,804) in men and 5,022 (SD 2,428) in women. Data collection will be completed in June 2009. Preliminary analysis based on winter and summer data from 66 participants demonstrates a mean reduction in walking of 647 steps/day (95% CI 107 to 1,186) during winter with a mean increase in systolic (6 mm Hg, 95% CI 0.1 to 11) and diastolic (2 mm Hg, 95% CI 0 to 4.5) blood pressure. Summer A1C values appeared higher than in winter (0.2%, 95% CI -0.06% to 0.46%) as did measures of abdominal obesity: waist circumference was higher in summer (2.8 cm, 95% CI 0.85-4.65) and waist to hip ratio demonstrated a similar trend (0.02, 95% CI 0 to 0.04). BMI, total energy intake, and carbohydrate intake did not differ significantly between winter and summer.

Discussion: Adults with T2D in Montreal are sedentary (< 5,000 steps/day) to low active (< 7,500 steps/day). During the winter months they experience a 12% reduction in walking volume and substantial increases in blood pressure. The trends in increase in A1C and abdominal adiposity may represent a delayed impact of the winter walking deficit. Accumulation of further data will permit us to assess the inter-relationships among the seasonal changes that we have detected. Our preliminary findings support the need for interventions to increase walking volume, prevent a winter walking deficit, and monitor and treat blood pressure with attention to seasonal differences.

No conflict of interest

D-0777

Effect of exercise therapy on lipid profile and oxidative stress indicators in patients with type 2 diabetes

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Objective: This study investigated the impact of Hatha yoga and conventional physical training (PT) exercise regimens on biochemical, oxidative stress indicators and oxidant status in patients with Type 2 diabetes.

Methods: This prospective randomized study consisted of 231 patients: 77 type 2 diabetic patients in the Hatha yoga exercise group (62 females and 15 males) that were matched with 77 Type 2 diabetic patients in the conventional PT exercise group and another group 77 Type 2 diabetic patients serving as the control group. Biochemical parameters such as fasting blood glucose

(FBG), serum total cholesterol (TC), triglycerides, low-density lipoprotein (LDL), very low-density lipoprotein (VLDL), and high density lipoprotein (HDL) were determined at the beginning (baseline) and at two consecutive three monthly intervals. The oxidative stress indicators (malondialdehyde- MDA, protein oxidation- POX, phospholipase A2-PLA2 activity) and oxidative status [superoxide dismutase (SOD) and catalase activities] were measured.

Results: The concentration of FBG in the Hatha yoga and conventional PT exercise group after six months decreased by 29.48% and 27.43% respectively ($p<0.0001$) and there was a significant reduction in serum TC in both groups ($p<0.0001$). The concentrations of VLDL in the managed groups after six months differed significantly from baseline values ($p=0.036$). Lipid peroxidation as indicated by MDA significantly decreased by 19.9% and 18.1% in the Hatha yoga and conventional PT exercise groups respectively ($p<0.0001$); whilst the activity of SOD significantly increased by 24.08% and 20.18% respectively ($p=0.031$). There was no significant difference in the baseline and six months activities of PLA2 and catalase although the latter increased by 13.68% and 13.19% in the Hatha yoga and conventional PT exercise groups respectively ($p=0.144$).

Conclusion: The findings of the study demonstrate the efficacy of Hatha yoga exercise on fasting blood glucose, lipid profile, oxidative stress markers and antioxidant status in patients with Type 2 diabetes mellitus, and suggest that Hatha yoga exercise as well as conventional PT exercise may have therapeutic preventative and protective effects on diabetes mellitus by decreasing oxidative stress and improving anti-oxidant status.

No conflict of interest

D-0778

Effects of resistance exercise and aerobic exercise training on muscular mass and strength in type 2 diabetic subjects

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Object: The energy-restricted diets result in desired body fat loss, and undesired lean tissue loss. Older obese persons with decreased muscle mass or strength are at special risk for adverse outcomes. The purpose of the present study was to investigate the effect of resistance exercise or aerobic training program on muscular mass and strength during weight reduction in individuals with type 2 diabetes.

Method: Twenty eight overweight women with type 2 diabetes (age: 55.7±7.5 years, body mass index 27.1±2.3kg/m^2) were randomly assigned to resistance exercise group (RG, n=13), using elastic band three times per week at about 40-50% of maximal exercise capacity under supervision, and aerobic exercise group by walking (AG, n=15), which was monitored with accelerometer. During the intervention period, all participants were asked to be on the conventional diet. We assessed muscular mass using dual-energy X-ray absorptiometry (DXA, GE, Lunar, Prodigy, USA) and muscular strength using chest and leg press (KEISER, USA) for one repetitive maximum (1RM) of upper extremities (UE) and lower extremities (LE), before and after 12-week exercise program.

Result: After 12-wk training program**,** body weight was decreased significantly in each group, however, there was no difference between groups (RG: -1.1±1.3kg vs. AG: -1.9±1.2kg, P=0.076). Fat mass was reduced in both groups, but the change was more prominent in AG (-5.4% for AG, -1.3% for RG, P=0.038). Muscular mass of UE and LE of RG increased from baseline (+5.3%, +1.3%, respectively), whereas that of AG remained unaltered (-0.3%, -0.1%, respectively), which difference was statistically significant in UE (P=0.001), but not in LE (P=0.322). Furthermore, resistance training was related to greater increase in muscular strength compared with aerobic exercise. RG showed the increase of 1RM (+12.1% of UE, +11.6% of LE), while in case of AG, 1RM was reduced (-11.6% of UE, -7.2% of LE), which made statistically significant differences between groups (P<0.001 for UE, P=0.006 for LE).

Conclusion: We suggest that when body weight loss is induced to the similar extent, resistance exercise training may be more efficient for improving muscular mass and strength than aerobic exercise in obese female type 2 diabetic subjects, although aerobic exercise is more effective in fat loss.

No conflict of interest

D-0779

Low cardiorespiratory fitness is a characteristic feature of youth-onset type 2 diabetes mellitus (T2DM)

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Background: While cardiorespiratory fitness (CF) is an emerging independent determinant of T2DM in adults, its role as a risk factor or biomarker for T2DM in youth has yet to be studied extensively.

METHODS: We recruited 103 adolescents aged 13-18 yrs spanning the natural history of T2DM to participate in a cross sectional study of CF and the risk for T2DM in youth. Between March 2007 and March 2009 we screened 15 healthy weight normal glucose tolerant controls, 63 overweight normal glucose tolerant controls and 26 adolescents with T2DM. The primary comparison of interest was CF between all three groups, after adjusting for confounding variables (adiposity, age and ethnicity). CF was assessed directly by measuring the rate of oxygen consumption at the end of a graded maximal exercise test to exhaustion, and was expressed relative to fat-free mass (FFM). Secondary outcomes for this study that relate to T2DM risk included, (1) insulin sensitivity, measured directly with Bergman's frequently sampled intravenous glucose tolerance test, (2) hepatic triglyceride content measured with magnetic resonance spectroscopy and (3) percent body fat measured with dual x-ray absorptiometry.

Result: The mean age (15 ± 2 yrs) and proportion of girls (~65%) was similar across all three groups. Although youth with T2DM displayed significantly greater BMI Z score relative to normoglycemic overweight controls (2.1 ± 0.5 vs 1.9 ± 0.5, $p < 0.05$) they were evenly matched for percent body fat (37 ± 7 vs 35 ± 8%). The primary outcome measure of maximal oxygen uptake (expressed relative to fat free mass) was 10 and 21% lower in youth with T2DM relative to overweight (40 ± 7 vs 45 ± 7 ml/kgFFM/min; $p<0.01$) and healthy weight controls (40 ± 7 vs 50 ± 7 ml/kgFFM/min; $p<0.001$). Additionally, maximal workload (expressed as watts/kg FFM) was also lower in youth with T2DM (31% and 18% respectively; $p<0.001$), relative to normal weight and overweight subjects. CF was also independently associated with insulin sensitivity (ß = 0.16, p = 0.02) and hepatic triglyceride content (ß = -0.35, p = 0.015) within all 103 adolescents.

Conclusion: Low CF is a characteristic feature of T2DM in youth and significantly associated with objective measures of T2DM in adolescents. These data reinforce the notion that CF is an important modifiable lifestyle factor in the prevention of T2DM in youth.

No conflict of interest

D-0780

Exercise capacity and mortality in elderly diabetics

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Introduction: Chronological aging in healthy subjects is associated with declines in muscle mass, strength, endurance, and aerobic fitness, with concurrent increase in adiposity, insulin resistance, and type 2 diabetes. These changes are particularly pronounced after the fifth decade of life. As with young healthy individuals, however, older subjects seem to respond favorably to exercise, suggesting that physical inactivity plays an important role in age-related dysfunctions. We and others have shown that exercise capacity is a strong predictor of all-cause mortality in type 2 diabetes. However, the role of aging has not been investigated extensively.

Methods: A total of 2755 men, age ≥50 years of age with type 2 diabetes from the VAMC, Washington DC, and Palo Alto, California, underwent routine exercise tolerance testing. Peak workload was estimated in metabolic equivalents (METs). Fitness categories (i.e., Low-Fit, Moderate-Fit, High-Fit) were established based on peak METs achieved, adjusted for age. All-cause mortality is reported with a follow-up period of 7.5±5.0 years. The age groups included 50-69 (Group-1; n=2086) and 70 or above (Group-2; n=669). Cox proportional hazard models were applied after adjusting for age, BMI, history

of CV disease, CV medications and traditional CV risk factors (p-values <0.05 using two sided tests were considered statistically significant).
Results: There were a total of 481 deaths in Group-1 (23.1%) and 287 deaths in Group-2 (42.9%). For every 1-MET increase in exercise capacity, the mortality risk was lowered by 21% (HR=0.79; CI: 0.75-0.83; p<0.001) in Group-1 and 15% in Group-2 (HR=0.85; CI: 0.80-0.89; p<0.001). Mortality risk decreased across fitness categories in both age groups. The association was inverse and graded. Specifically, in Group-1, mortality risk was 47% (HR=0.53; CI: 0.44-0.65) and 69% (HR=0.31; CI: 0.22-0.43) lower for Moderate-Fit and High-Fit, respectively, when compared to the Low-Fit. In Group-2, the mortality risk was approximately 42% for the two highest fitness categories (HR=0.58; CI: 0.45-0.75).
Conclusions: Aerobic capacity is associated with lower mortality risk in type 2 diabetic individuals 50-69 years of age and 70 years or older. Physical fitness, as represented by exercise capacity, lowers mortality risk in diabetics in all age groups.

No conflict of interest

D-0781

Ethnic-specific differences in physical activity observed in a population-based diabetes screening programme

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Aims: The aim of this study was to comprehensively investigate ethnic-specific differences in physical activity in a bi-ethnic population in the United Kingdom (UK). Previous research has suggested that migrant South Asians (SA) engage in lower levels of physical activity compared to white Europeans (WE) in the UK and other Western industrialized countries. However, much of this data comes from crude, non-validated, measures of physical activity.
Methods: This study reports physical activity levels from the Leicester-ADDITION study, UK: a population-based screening study that has screened 6371 WE and SA individuals. Physical activity was measured using the short self-administered format of the International Physical Activity Questionnaire (IPAQ). IPAQ measures the frequency and duration of any walking or other moderate- to vigorous-intensity physical activity undertaken for more than 10 continuous minutes across all contexts over the last seven days and has been extensively validated.
Results: 1165 SA (male = 605, female = 560; missing data = 31%) and 4310 WE (male = 2035, female = 2275; missing data = 8%) had complete physical activity data. Table 1 shows the ethnic-specific differences across various categories of physical activity, overall and stratified by sex. Using regression modelling, the results for moderate- and vigorous-intensity physical activity were attenuated after controlling for age and sex; however the results for overall and walking activity remained unchanged.
Table 1: Ethnic specific differences in physical activity (data displayed as median (interquartile range)

Physical activity category	Energy Expenditure (MET-minutes/week)		P value (Mann-Whitney U test)
	White European	South Asian	
Total walking and other moderate- to vigorous-intensity			
Overall	2578 (918-4746)	1398 (396-4158)	<0.001
Male	2829 (1092-5850)	1710 (450-4175)	<0.001
Female	2246 (753-4158)	1237 (297-3930)	<0.001
Vigorous-intensity			
Overall	0 (0-1200)	0 (0-760)	0.001
Male	120 (0-1920)	0 (0-1200)	<0.001
Female	0 (0-600)	0 (0-480)	0.33
Moderate-intensity			
Overall	40 (0-1200)	0 (0-600)	<0.001
Male	240 (0-1680)	0 (0-720)	<0.001
Female	0 (0-720)	0 (0-360)	0.002
Walking			
Overall	1188 (396-2772)	594 (74-1980)	<0.001
Male	1188 (396-2772)	495 (66-2079)	<0.001
Female	1188 (347-2772)	693 (99-1980)	<0.001

Discussion/conclusion: This study found that SA were substantially less physically active than WE across all measured categories of physical activity. The median level of walking activity, the most accessible form of physical activity for the majority of individuals, was 50% lower in SA men and women compared to their WE counterparts. Given that migrant SA are known to have an elevated risk of developing diabetes and that increased physical activity is strongly linked to metabolic health, developing and evaluating physical activity interventions specifically tailored to SA migrant groups should be a public health priority in industrialized countries.

No conflict of interest

EDUCATION

Addressing psychosocial issues in diabetes education

D-0782

Assisting health care professionals in helping people with diabetes to overcome barriers to self-care: the Hellenic DAWN Assessment Model of Care (Greece)

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Aims: Managing diabetes can be a complex process, often leading to psychosocial barriers to self-care. The Hellenic DAWN Assessment Model is designed to encourage proactive interaction between health care professionals (HCPs) and people with diabetes. The model involves the use of a one-page assessment form in routine care, together with a number of optional interactive tools. The aim of the model is to introduce HCPs to basic psychological principles, thus assisting them in helping people with diabetes to overcome barriers to effective management.
Methods: A one page form was developed consisting of the WHO-5 Well-being index, a further 9 items relating to diabetes specific psychosocial distress (DSPD), and a clinical data section. A series of interactive tools designed for optional use were also produced. 23 physicians administered the form to 400 patients (male = 41%, female = 59%) in rural and urban areas across Greece.
Results: The form showed good internal consistency for both the WHO-5 (a = 0.86), and DSPD (a = 0.79) sections of the form. WHO-5 and DSPD significantly correlated with diabetes treatment type (r = -.16, r = -.30, p = 0.01) and clinical measures including HbA_{1c} (r = -.17, r = -.31, p = 0.01), and BMI (r = -.30, p = 0.01). The form discriminated between different patient groups based on HbA_{1c} (p = <.020, p = <.001), sex (p = <0.001, p = <0.001), and treatment type (p = <0.030, p = <0.001). Multiple regression analyses indicated WHO-5 section as a predictor of BMI (p = <0.001), and DSPD as a predictor of HbA_{1c} (p = <0.001). Differences were identified between people attending primary care settings (located mainly in rural regions), and those in secondary care settings.
Discussion/conclusion: The assessment form is psychometrically reliable and valid, and feedback confirms the usefulness of the form and future advantages in the use of the interactive tools. The Hellenic DAWN Assessment Model is of particular value to HCPs with limited resources, and is a useful and practical method for assisting them in the identification and resolution of psychosocial barriers to diabetes self-care. Results from the pilot study indicate strong relationships between the WHO-5 and BMI, and between DSPD and HbA_{1c}. As such, the longer term effects of this approach may lead to positive outcomes in terms of BMI and HbA_{1c} as a result of addressing diabetes related distress and the effects of diabetes on well-being, at an individual patient level. The model is currently undergoing further investigation among GPs in rural island and mountainous regions, with a view to ensuring its cultural relevance amongst indigenous groups of people with specific traditions and beliefs. Evaluation of the use of the interactive tools and guidance documents at a nationwide level will be performed shortly.

No conflict of interest

D-0783

Correlates of self-care success in the Diabetes Attitudes, Wishes and Needs youth study

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Aims: This study assessed parent-reported and patient-reported social, family, psychological, and health care factors associated with perceived self-care success among youth (age 0-25) with diabetes.
Methods: The Diabetes Attitudes, Wishes and Needs (DAWN) Youth Study conducted two cross-sectional internet surveys of independent national samples of: (1) parents of children/adolescents (age 0-18) with diabetes (N=4099) and (2) young adults (age 18-25) with diabetes (N=1905). Respondents from the US, Japan, Brazil and 5 countries in Europe provided self-report data for all measures. Self-care success was a 7-item scale measuring success in controlling blood glucose, taking medications, SMBG, diet and exercise. Hierarchical multiple regression was used to assess significant ($p<.05$) independent associations with self-care success. All analyses controlled for country of residence and a variety of demographic and disease characteristics. Parallel factors were included in both models, but some unique factors were available in each survey.
Results: In both populations more information at diagnosis and more perceived communication among health care team members were associated with more self-care success. In both populations greater perceived physician support and understanding of the difficulties of living with diabetes, and respondent involvement in decision-making about diabetes care were associated with more self-care success, and the physician factors mediated the relationships of success with information at diagnosis and health care team communication. Health care factors accounted for about one-quarter of the model's explanatory power in both populations. Among young adults family and friend support were both associated with more self-care success. Among young adults diabetes coping success, subjective quality of life, and psychological well-being were associated with more self-care success and accounted for half of the model's explanatory power. Among children/adolescents more parent-reported agreement within the family about diabetes care responsibilities and patient diabetes coping success were associated with more self-care success and accounted for more than half of the model's explanatory power.
Discussion/conclusions: Self-care success of youth with diabetes is multi-factorially associated with social, health care, parent and patient factors. Correlates of self-care success were similar among young adults and children/adolescents. These results suggest that promising strategies for improving self-care outcomes include enhancing greater provider empathy and support, parent and patient participation in health care, parent-child collaboration in self-care, and patient psychological coping with diabetes.

Conflict of interest:
Paid lecturing: Mark Peyrot, Novo Nordisk
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D-0784

Illness representations as predictor of self-care behaviour and diabetes control in type 2 diabetes patients

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Background and aims: According to the common-sense model of self-regulation of health and illness (Leventhal et al., 1997), illness representations (IR) are among the key factors impacting health behaviour (HB). The goal of this study was to determine whether and which relationship is there between type 2 diabetes patients' (T2 DM pts) IR and HB, as well as DM control to be able to predict HB. This could raise the possibilities to explore patient's illness perception and adjust it during the education, which will result in achieving an improved adherence to self care and better metabolic control.
Methods: In our study, 67 respondents (43% males and 57% females, T2 DM for more than one year) aged 50-80 yrs were participated. DM was treated with oral antidiabetic agents in 27% cases, with oral antidiabetic agents and insulin in 25% cases, and with insulin alone in 48% cases. Respondents were asked to complete the modified Illness Perception Questionnaire (IPQ-R) and Diabetes Self-Care Behaviour Questionnaire (DSCBQ). The HbA_{1C} level was determined. IPQ-R (Weinman et al., 1996) was designed to measure 8 scales of IR–Identity, Timeline, Illness consequences, Personal control, Treatment control, Illness coherence, Timeline cyclical, Emotional representations. DSCBQ designed by the study group is a 7-item self-report questionnaire, determining how frequently a DM pt was following the HCP advice on self-care within the last 4 weeks. Self-care behaviour index (CSBI) for each respondent was obtained.
Results: A correlation (Spearman's r) between variables in 8 scales of IPQ-R, SCBI and HbA_{1C} was obtained. The r between SCBI and scores in Illness consequences scale and Personal control scale was high (r=0.315 and r=0.322 respectively; $p<0.01$). The r between SCBI and scores in Illness coherence scales and Timeline scales was moderate (r=0.206 and 0.193, respectively; $p<0.1$).
In regression analysis, an increase of SCBI over the period was predicted by both Personal control scale (ß=0.63, $p<0.05$) and Illness consequences scale (ß=0.39, $p<0.05$).
When predicting changes in $HbA_{1C,}$ Treatment control (ß=0.15, $p<0.05$), Timeline (ß=0.17, $p<0.05$) and Emotional representations (ß=0.1, $p<0.05$) were related to increases in HbA_{1C} values.
Conclusion: Higher HB adherence was found to be associated with DM pt's perception about more serious consequences of the illness and about highest personal control impact on treatment results. Better DM control seemed to be interrelated with higher scores in pt's beliefs in treatment effectiveness, belief in longer duration of the illness and harder emotional consequences of the illness. Facts on connection between IR and HB stated in the study may improve pt's education, supplementing it with activities aimed at investigation of illness perception and its correction.

No conflict of interest

D-0785

Characteristics of hypoglycaemia and hypoglycaemic fear in patients with diabetes mellitus in Japan

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Aims: Hypoglycemia is the most common complication of therapy of diabetes, at the same time, the consequences of hypoglycemia can be quite aversive and potentially life threatening. In Japan, there is no study about hypoglycemic fear, because there is not suitable questionnaire to measure. In this study, it is focused to evaluate hypoglycemic fear in Japanese diabetic patients using the Hypoglycemic Fear Survey (HFS), which was developed as a research tool measuring the degree of fear experienced with respect to hypoglycemia, Japanese version.
Method: Translation of HFS into Japanese was performed following the Guideline Recommended for Translation of Questionnaires.
Two hundred diabetic patients with type1 or type2 participated in this study. All inventories were sent by mail, and the patients who agreed to participate signed, filled out and sent back to the investigator.
The Questionnaire addresses experience related to hypoglycemia within 1 year; presence of symptoms, frequency, assessment of confidence in ability to discriminate hypoglycemia, behavioral responses to hypoglycemia and frequency of SMBG.
HFS focuses on worries about hypoglycemia (HF-Worry) and behaviors designed to avoid hypoglycemia (HF-Behavior).
HbA1c were collected over a 1yr period.
Results: One hundred twenty-five completed inventories were analyzed. While almost all type1 and type2 patients with insulin have hypoglycemic symptoms, over 50% of the type2 patients with OHA had no hypoglycemic symptoms. The patients who have hypoglycemia awareness were about 40 % even in type1 patients.
The mean scores of HF-Behavior and HF-Worry are, 16.1±6.4, 16.8±11.9 in type1 patients, 9.4±6.3, 6.2±6.4 in type2 patients using insulin and 3.2±6.3, 3.8±8.0 in type2 patients using OHA, respectively.
HF-worry is significantly correlated to age, type of diabetes, using insulin, presence of hypoglycemic symptoms, experience of trouble in work due to hypoglycemia, the score of STAI, SDS and MMPI alexithymia scale. There is no significant correlation between hypoglycemic fear and glycemic control.
Discussion/conclusion: Hypoglycemic fear in patients with diabetes in Japan is remarkably low compared with the data of Western studies. The most

important factor affecting exposure to hypoglycemia is type of diabetes. In type1 patients, who have most exposure to hypoglycemia, anxiety has no effect on the score of HF-worry. On the other hand, in the patients with type2 on OHA, who have less exposure to hypoglycemia, those with more anxiety have more hypoglycemic worry. There are several patients with low anxiety and low HbA1c with severe hypoglycemia. These patients are thought to be at high risk of severe hypoglycemia. Understanding of hypoglycemic fear is thought to be important to get good adherence in diabetic treatment, while the psychological characteristic is grasped.

No conflict of interest

D-0786

Association between diabetes-related distress and postprandial hyperglycemia in patients with diabetes

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Aims: "Diabetes distress" (DD) is a patient's persistent feeling of being overwhelmed by the emotional burden stemming from daily self-management requiring frequent attention, support, and access to care. These responses are found in a substantial number of diabetic patients, are distinct from true depression/anxiety, and can lead to diminished quality of life. They may affect postmeal elevations and excursions of blood glucose (postprandial hyperglycemia, or PPH), because of the close connection between food and emotions. PPH is a frequent contributor to overall suboptimal glycemic control and is a risk factor for cardiovascular mortality in patients with diabetes. The objective of this study was to explore the association between DD and PPH in patients with diabetes.
Methods: We estimated the degree of DD by means of a simple, validated screening scale (the DDS2, Fisher et al. 2008) in patients seen at the Diabetes Unit of an academic specialty practice. The DDS2 is a brief diabetes distress screening instrument consisting of a 2-item questionnaire that asks respondents to rate on a 6-point scale the degree to which the following items caused distress: (1) feeling overwhelmed by the demands of living with diabetes, and (2) feeling that I am often failing with my diabetes regimen. A score ≥6 is significant, with higher scores denoting increased DD. Degree of PPH was measured by the 1,5-anhydroglucitol level (1,5-AG, or GlycoMark). Levels of >10, 5-10, and <5 ug/ml denote postprandial glucose that is well-controlled, moderately-controlled, and poorly controlled respectively (McGill et al. 2004).
Results: The DDS2 was administered to, and the 1,5-AG level measured in, 113 patients with diabetes (71 women and 43 men, average age 54 years). 32 had type 1 and 81 had type 2 diabetes. The average DDS2 score was 6.2 and the average 1,5-AG was 6.4 ug/ml. The average 1,5-AG in patients with mean DDS2 score <6 (n=49) was 4.9 ug/ml and in those with DDS2 score ≥6 (n=64) was 6.8 ug/ml. The average DDS2 score was 7 for women and 4.7 for men.
Discussion: Higher degrees of DD correlate with PPH and may impact it. Mediating factors may include inadequate coping mechanisms, nutritional choices, and pathophysiologic changes. Diabetes-related distress appears to be more in women than men. Although the results point to an interesting association, causality cannot be inferred. Our findings emphasize the need for further research into understanding the dynamics and gender differences related to psychological stressors of diabetes, particularly as they affect diet and meal-related glucose excursions. Simple office-based tools can identify increased DD and such patients can be targeted by a focused multipronged therapeutic approach with supportive, dietary, and pharmacologic interventions.

No conflict of interest

D-0787

Lifestyle and self-care behaviours among diabetics with major, minor and no depression: a population based study of adults with diabetes in Quebec

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Adherence to positive lifestyle and self-care behaviours is a challenge for individuals with diabetes and poor mental health. The aim of this study was to determine whether status of depression was associated with lifestyle-related and diabetes self-care behaviours among individuals with diabetes. The method consisted of a telephone survey of a representative sample of 2003 adults with diabetes in Quebec (54.5% women and 45.5% men). Depression status (major, minor, and no depression) was evaluated using the Patient Health Questionnaire (PHQ-9). Lifestyle-related behaviours included: physical activity, tobacco use, BMI, and number of previous dieting attempts. Self-care behaviours included: testing blood glucose on a daily basis, seeing a physician for diabetes in the past 12 months, and perceptions of diabetes control. Results indicated that 8.7%, 10.9%, and 80.4% had major, minor, and no depression, respectively. There were significant associations between depression and lifestyle and self-care behaviours. Subjects with major and minor depression were more likely to be physically inactive (52.9%, 43.2%, no depression 25.5%), smokers (42.5%, 21.2%, no depression 19.0%), perceive poorer diabetes control (43.4%, 34.3%, no depression 19.9%), and less likely to see a physician for their diabetes within the past year (79.3%, 82.9%, no depression 86.1%). Contrary to what was expected, those with major and minor depression were more likely to test their blood glucose levels daily (78.8%, 71.5%, no depression 66.7%). Status of depression (major, minor, and no) was not significantly associated with BMI categories (normal weight: BMI less than 25; overweight: BMI 25-29; obesity: BMI of 30 and more), nor with the number of previous dieting attempts (number of times in a lifetime of going on a diet and losing more than 10 kg body weight). Rates of obesity were high, over 30%, in each group. In conclusion, depression was associated with poorer lifestyle behaviours, poorer diabetes control, and more frequent daily testing of blood glucose levels. Despite more frequent blood glucose testing and poorer perceived control, those with depression did not see their physician as frequently for their diabetes management. Strategies to reach depressed individuals with diabetes in Quebec and provide them with the adequate follow-up care are needed. This study was funded by the Canadian Institutes of Health Research (CIHR).

No conflict of interest

D-0788

Investigating racial/ethnic differences in the relationship between psychosocial variables and diabetes self-management

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Diabetes has risen to epidemic proportions worldwide, and understanding the psychosocial factors that may affect behavioral self-management is crucial. Guided by Weiner's (1995) cognitive model of social conduct, we investigated whether a perception of personal responsibility for disease onset and self-blame might lead to better, or potentially worse, disease management for people with diabetes. Previous research in this area suggests that personal judgments of responsibility for disease onset do affect trait anger and self-blame. In turn, these variables influence perceptions of negative and positive social support which have been shown to be important predictors of self-reported disease management. This research, however, was conducted with a largely non-Hispanic white population, and further research is clearly necessary to examine the influence of these psychosocial variables in other groups – particularly those that are disproportionately affected by diabetes (e.g, African Americans, Latinos, etc.). In the present study, fifty-one individuals with diabetes (of which 11 self-identified as Latino/a) completed a confidential survey assessing personal judgments of responsibility for disease onset, trait anger, self-blame,

perceived social support, diabetes self-efficacy, and disease management. An overall multivariate analysis of the effect of race on our model variables was marginally significant, and univariate analyses revealed two interesting findings. First, race was significantly related to perceptions of responsibility for disease onset, *F(1,30) = 4.24, p < .05*.Latinos (*M = 6.86)* rated themselves significantly higher on responsibility for disease onset than did non-Hispanic whites (*M = 3.68)*. Second, race was significantly related to negative social support, *F(1,30) = 10.49, p < .01*. Latinos (*M = 16.14*) rated themselves significantly higher on negative social support than did non-Hispanic whites (*M = 11.16*).Ultimately, diabetes self-efficacy was strongly and positively related to disease management in both groups, F(5, 37) = 8.96, p < .01, partial eta-squared = .55, power = 1.00. The confluence of data in this area indicates that interventions designed to improve diabetes self-efficacy, the perception of available social support, and anger management or disease acceptance may offer additional mechanisms to improve diet, exercise, and blood glucose testing in individuals with diabetes. However, models of cognitive processes predicting the consequences of judgments of responsibility for disease onset do not appear to be sufficiently sensitive to important variability among different racial and ethnic groups. These data indicate that racial, ethnic, and cultural differences are important to understanding diabetes self- management.

No conflict of interest

D-0789

Yoga in prediabetes: long term (1-year) follow up in IFG and IGT

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Yoga and other complementary and alternative medicines have been studied in many countries for controlling both the symptoms and the complications associated with diabetes mellitus, but not yet in prediabetes and prevention of type 2 diabetes mellitus.

Aim: Beneficial effects of Yoga in improving metabolic profiles among subjects with prediabetes are studied.

Methods: A 1-year randomized controlled follow-up trial in subjects (n=25 in control and n=116 in Yoga groups) aged 30-70 years with prediabetes (IFG and/or IGT) was conducted. Baseline demographic, clinical and biochemical characteristics were similar in control and Yoga groups - BMI (26.3±3.0 and 27.1±4.5 kg/m^2), waist-to-hip ratio (0.96±0.06 and 0.92±0.06), systolic BP (129.7±18.5 and 126.1±16.1 mmHg), diastolic BP (81.7±10.3 and 82.8±10.4 mmHg), fasting (103.4±10.3 and 103.2±7.3 mg/dl) and 2-hr OGTT plasma glucose (133.9±36.1 and 148.2±31.0 mg/dl), serum cholesterol (186.6±40.5 and 183.8±22.1 mg/dl), triglycerides (138.8±85.9 and 126.0±37.9 mg/dl), HDL cholesterol (36.9±7.1 and 39.5±6.0 mg/dl) and HbA1c (5.9±0.8 and 5.8±0.5%). Yoga would consist of approximately 30 minutes a day of specific Yoga *asanas* (postures) and *pranayama* (breathing exercises) which are known to improve glucose tolerance. Study subjects were trained to perform Yoga (*Bhujanga, Shalabha, Dhanur, Vichitrakarna, Ardha-Matsyendra, Paschimothana, Yoga Mudra and Shava asanas*) before and during the study by an instructor at 3 monthly intervals.

Results: In Yoga group, by the end of 12 months there were improvements in BMI (27.1±4.5 at entry and 26.8±4.5 after 12 months), systolic BP (126.1±16.1 at entry and 125.2±15.9 after 12 months), diastolic BP (82.8±10.4 at entry and 82.4±13.7 after 12 months) and significant reduction in waist-to-hip ratio (0.92±0.06 at entry and 0.89±0.07 after 12 months, p<0.05). Unlike in controls, subjects in Yoga group have shown significant reductions in fasting (103.4±10.3 at entry and 99.5±14.1 mg/dL after 12 months, p<0.05) and 2-hr OGTT plasma glucose (148.2±31.0 at entry and 135.8±41.7 mg/dl after 12 months, p<0.05), LDLc (122.6±32.5 at entry and 113.7±30.6 mg/dL after 12 months, p<0.05) and an appreciable difference in HbA1c (5.9±0.8 at entry and 5.8±0.5% after 12 months, ns) and HDLc (36.88±7.13 at entry and 38.36±9.70 mg/dL after 12 months, ns). Mean differences between biochemical values (at entry and end of 12 months) revealed significant improvements in 2-hr OGTT plasma glucose, total cholesterol, HDLc and LDLc (p<0.05) in Yoga group.

Conclusion: Prediabetics showed better improvement in their anthropometric and metabolic profiles following Yogic practices than with conventional life style interventions. Early Yoga intervention and thereby avoidance or delay of progression to type 2 diabetes is of enormous benefit to people with prediabetes in terms of increasing life expectancy and quality of life, and potentially in economic terms for society and health-care payers.

No conflict of interest

FOUNDATION SCIENCE

Insulin secretion and signal transduction

D-0790

Defect glucose-stimulated insulin secretion in diet-induced obesity mice is associated with altered lipid metabolism/signaling

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C57Bl/6 mice develop obesity and mild diabetes when fed with a high fat diet (60% of energy as fat; HFD; DIO mice). Although DIO is perhaps the most widely studied model of obesity associated type 2 diabetes, little is known about the mechanisms responsible for ß-cell failure in DIO mice. After 8 weeks of HFD, individual mice displayed differential weight gains and blood glucose levels. We separated DIO mice in two groups according to their body weight and fed blood glucose values. Following 8 wks of HFD, low-DIO-responders (LDR) weighed 34-38.9g with an average glycemia of 158 mg/dl. High-DIO-responders (HDR) weighed 39g-44g and had an average glycemia of 180 mg/dl. The control group (normal diet, ND), fed with a standard chow (15% of energy as fat), had an average weight of 28g and a glycemia of 140 mg/dl. Hyperinsulinemic-euglycemic clamp showed that HDR are more insulin resistant than LDR mice. First phase glucose-stimulated insulin secretion (GSIS) in vivo was defective in both DIO groups. Isolated LDR islets showed a 50% reduction of GSIS as compared to the ND group, and HDR islets did not respond to glucose. The defect of insulin release was not due to a reduction in glucose metabolism in DIO mice since islet glucose utilization and oxidation were similar in the three groups. Glucose-stimulated lipolysis was decreased in both DIO islet groups, whereas fat oxidation was augmented in HDR islets only. Fatty acid esterification into neutral glycerolipids measured at low glucose was reduced in LDR islets, and further diminished in HDR mice. Reduced fatty acid esterification and lipolysis in DIO islets is indicative of altered glycerolipid/fatty acid (GL/FA) cycling, which has been proposed to be implicated in GSIS and ß-cell compensation for insulin resistance. The islet TG content was similar in all groups, and ß-cell mass was increased in DIO mice.

In conclusion, LDR mice have a milder phenotype in terms of insulin resistance and altered GSIS compared to HDR. Altered ß-cell function in DIO mice is unrelated to a reduction in ß-cell mass, islet steatosis or changes in ß-cell glucose metabolism. It is possibly related to decreased GL/FA cycling. The more pronounced phenotype and altered ß-cell function in HDR mice may be ascribed to a more pronounced reduction of GL/FA cycling and an induction of "lipodetoxification" /fat oxidation with an associated price to pay: the removal of lipid signaling molecule and reduced GSIS.

No conflict of interest

D-0791

Pioglitazone acutely causes metabolic deceleration of the pancreatic ß-cell and reduces insulin secretion at submaximal glucose concentrations via AMP-kinase

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Thiazolidinediones (TZD) are agonists of nuclear peroxisome proliferator-activated receptor-gamma (PPAR-gamma) that have beneficial effects on glucose homeostasis via enhancement of insulin sensitivity and preservation of islet ß-cell function. The biochemical basis by which TZD preserve ß-cells is uncertain but might involve direct effects via both PPAR-gamma dependent and independent pathways. To gain insight into the PPAR-gamma-independent pathway(s) of TZD action, we assessed the effects of short-term (90 min or

less) exposure to pioglitazone (Pio) (10 to 50 µM) on glucose-induced insulin secretion (GIIS), AMP-activated protein kinase (AMPK) activation, and ß-cell metabolism in INS 832/13 ß-cells and isolated rat islets. Pio caused a right shift in the dose-dependency of GIIS, such that insulin release was reduced at intermediate glucose but unaffected at either basal or maximal glucose concentrations. Palmitate potentiation of GIIS was not altered by Pio nor was K^+-induced insulin release. This was associated in INS 832/13 cells with alterations in energy metabolism, characterized by reduced glucose oxidation, mitochondrial membrane polarization and ATP levels. Pio caused AMPK and acetyl-CoA carboxylase phosphorylation and its action on GIIS was reversed by the AMPK inhibitor compound C. Pio also reduced palmitate esterification into complex lipids (diacylglycerol, triacylglycerol, phospholipids) and inhibited lipolysis, but did not increase palmitate ß-oxidation. As for insulin secretion, the alterations in ß-cell metabolic processes were mostly alleviated at elevated glucose concentrations. In a similar way as Pio, the antidiabetic agents and AMPK activators metformin and berberine caused a right shift in the dose dependence of GIIS.
In conclusion, Pio acutely reduces glucose oxidation, energy metabolism and glycerolipid/fatty acid cycling of the ß-cell at intermediate glucose concentrations. Acute decrease in metabolism is potentially protective against toxic nutrient overload by decreasing reactive oxygen species production and by reducing endoplasmic reticulum stress due to reduced insulin biosynthesis. We suggest that AMPK activation and the metabolic "deceleration" of the ß-cell caused by Pio contribute to its known effects to reduce hyperinsulinemia and preserve ß-cell function, and to act as an antidiabetic agent.

No conflict of interest

D-0792

Glucose-stimulated insulin secretion is increased and diabetes prevented in ZDF rats following voluntary running exercise training

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Physical activity improves glycemic control in type 2 diabetes (T2DM) patients. However, several human studies reported either no improvement or a lowering of insulin secretion post-exercise-training. Our aim was to re-evaluate the role of physical activity on insulin secretion and the onset of diabetes using an established animal model of T2DM. At 6 wks of age, Zucker Diabetic Fatty (ZDF) and lean (ZL) rats were housed in a wheel cage where they could engage in voluntary running exercise for a period of 6 weeks. Inactive ZDF rats were characterized by progressive hyperglycemia (>20 mM), hyperlipidemia and marked loss of glucose-stimulated insulin secretion (GSIS). In contrast, physical activity prevented the development of diabetes (glycemia <10 mM). Moreover, active ZDF rats presented an 80% correction of their glucose excursion during an OGTT, which was associated with a 60% increase in plasma insulin (area under the curve). To investigate the biochemical basis of the beneficial effects of physical activity on ß-cell function, we studied isolated pancreatic islets. Voluntary running improved pancreatic islets GSIS and its amplification by free fatty acids. Islets from active ZDF rats had a 20 fold increase in insulin content which was associated with increased expression of the insulin, PDX-1 and mafA mRNAs when compared to inactive ZDF rat islets. In addition, the expression of the incretin hormone receptors for GLP1, GIP and FFA (GPR40) were also increased by training. Surprisingly, the triglyceride content of ZDF rat islets was not higher as compared to islets of ZL rats when expressed per mg islet protein (unlike when expressed per islet which are much larger in ZDF rats), indicating that ZDF islet cells were not steatotic. Exercise did not alter the islet TG content of ZDF rats. Fatty acid oxidation rates were lower in islets of both active and inactive ZDF rats in comparison to islets of ZL animals.
In conclusion, voluntary exercise protects from ß-cell failure in ZDF rats, at least in part by preventing ß-cell exhaustion characterized by a massive reduction in insulin stores. We are proposing a novel exercising paradigm for ZDF rats resulting in the prevention of diabetes via a significant improvement of GSIS. This model will be used to better understand the mechanisms by which physical activity provides protection against ß-cell failure and diabetes.

No conflict of interest

D-0793

Glucagon like peptide-1 induced signaling and insulin secretion do not drive fuel and energy metabolism in normal rodent pancreatic beta-cells

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Glucagon like peptide-1 (GLP-1) and its analogue exendin-4 (Ex-4) enhance glucose stimulated insulin secretion (GSIS) and activate various signaling pathways in the pancreatic beta-cell, in particular cAMP, Ca^{2+} and protein kinase-B (PKB/Akt). In many cells these signals activate intermediary metabolism. However, it is not clear whether the acute stimulation of GSIS by GLP-1 or Ex-4, which is also dependent on stimulatory glucose concentrations, involves in part metabolic alterations and the production of metabolic coupling factors. In the present study GLP-1 or Ex-4 at high glucose concentrations caused the release of ~20% of the total rat islet insulin content over 1h. While both GLP-1 and Ex-4 potentiated GSIS in isolated rat and mouse islets, neither had an effect on beta-cell fuel and energy metabolism over a 5 min to 3h time period. GLP-1 activated PKB without changing glucose usage and oxidation, fatty acid oxidation, lipolysis or esterification into various lipids in rat islets. Ex-4 did not acutely change islet respiration, as neither oxygen consumption nor mitochondrial ATP levels were altered. The results indicate that GLP-1 barely affects beta-cell intermediary metabolism and that metabolic signaling does not significantly contribute to GLP-1 potentiation of GSIS. The data also indicate that insulin secretion is a minor energy consuming process in the beta-cell, and that the beta-cell is different than most cell types in that its metabolic activation appears to be primarily governed by a "push" (fuel substrate driven) process, rather than a "pull" mechanism secondary to enhanced insulin release as well as to Ca^{2+}, cAMP and PKB signaling.

No conflict of interest

D-0794

A novel thiazolidinedione BLX-1002 selectively stimulates glucose-, GLP-1- and tolbutamide-induced insulin secretion in diabetic animal models

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BLX-1002 is a novel amino acid conjugated, small thiazolidinedione with no apparent affinity to peroxisome proliferator–activated receptors (PPAR) that was shown to reduce glycemia in type 2 diabetes without adipogenic effects. We have investigated the actions of the drug on insulin secretion in pancreatic islet cells from diabetic and non-diabetic animal models. In the obese, leptin-deficient ob/ob mice, BLX-1002 enhanced insulin secretion stimulated by high (20 mM), but not low or intermediate (3 or 8 mM) glucose concentrations during a 20 min-incubation, while its major metabolite BLX-1015 had no effect. BLX-1002 also potentiated pioglitazone-, but not fenofibrate-induced insulin secretion. BLX-1002, but not BLX-1015, restored glucose-sensitive insulin secretion in pancreatic islets from type 2 diabetic, leptin receptor-deficient db/db mice. Under perifusion conditions, BLX-1002 significantly potentiated insulin secretion induced by GLP-1 or the sulfonylurea tolbutamide in pancreatic islets from type 2 diabetic Goto-Kakizaki (GK) rats, effects that were not observed in islets from non-diabetic Wistar rats. In contrast, BLX-1015 was without effect. Studies in single islet cells from ob/ob mice revealed that BLX-1002 augmented $[Ca^{2+}]_i$ at high glucose, which was abolished either by the L-type Ca^{2+} channel blocker nifedipine or by pre-treatment of the cells with the Ca^{2+}-ATPase inhibitor thapsigargin. The BLX-1002-induced rise in $[Ca^{2+}]_i$ was significantly suppressed by the selective phosphatidylinositol (PI) 3-kinase

(PI3K) inhibitor LY294002. However, BLX-1002 interfered neither with voltage-gated Ca^{2+} channel nor with KATP channel activities as demonstrated using patch-clamp technique. In addition, cellular NAD(P)H stimulated by glucose was not affected by the drug. The stimulatory effect of BLX-1002 on insulin secretion at high glucose was completely abolished by treatment of the cells with the PI3K inhibitors wortmannin or LY294002. Furthermore, stimulation of the b-cells with BLX-1002 induced activation of AMPK at high glucose. Our study suggests that BLX-1002 selectively potentiates insulin secretion induced by high glucose, GLP-1 or tolbutamide in b-cells from obese or diabetic animal models, but not from healthy animals. The effect of BLX-1002 on glucose-induced insulin secretion is dependent on PI3K activity and is associated with an increased $[Ca^{2+}]_i$ and AMPK activation. The glucose-sensitive stimulatory impact of BLX-1002 on b-cell function may translate into substantial clinical benefits of the drug in the management of type 2 diabetes, by avoidance of hypoglycemia.

No conflict of interest

D-0795

Differences in metabolic regulation between two sister clonal rat ß-cell line INS-1 832 decides their ß-cell functionality

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Aims: In order to investigate the putative metabolic disturbances in ß-cells that affect glucose-stimulated insulin secretion we investigated two subclones of INS-1 exhibiting different properties: 832/13 cells are glucose-responsive while the 832/2 cells are glucose-nonresponsive. The insulin content of the cells is the same and ATP-independent closing of K^+ channels evokes insulin release in both cell types. This leads us to hypothesize that the difference in insulin response could have a metabolic origin and that the metabolic difference is reflected by differences in gene expression.

Methods: Insulin secretion was measured by RIA. Metabolix flux was assessed by Extracellular flux analyzer XF24 (Seahorse Bioscience, Billerica, MA). Lactate was measured using a colorimetric lactate assay kit (Biovision, Mountain view, CA, USA). A TaqMan Low density array (LDA) (Applied Biosystems, Foster City, CA, USA,) was performed.

Results: The INS-1 832/13 were robust secretors of insulin (>8-fold) when stimulated by an elevation in glucose from 2.8 mM (low glucose) to 16.7 mM (high glucose) whereas the same settings failed to evoke increased insulin release in INS-1 832/2.

INS-1 832/13 cells showed a considerable increase in Oxygen consumption rate (OCR) when stimulated with high glucose; this effect was abundant in INS-1 832/2. They also displayed a poorer response to the metabolic modulators oligomycin, FCCP and Rotenone.

INS-1 832/2 cells secreted 140 nmol/mg prot/h of lactate at high glucose while lactate secretion from the INS-1 832/13 was not detected.

The Extracellular acidification rate (ECAR) of 832/13 cells basically paralleled the OCR, suggesting that it is mainly accounted for by CO_2 production. In the 832/2 cells, the ECAR was 3.6 fold higher, and increased in response to oligomycin and FCCP.

LDAs showed that genes for glycolytic metabolism as well as LDH were up-regulated in 832/2 while a number of mitochondria-related genes were down-regulated compared to glucose-responsive 832/13.

Discussion/conclusion: We conclude that tight coupling between the glucose stimulus, via glycolysis, and the rate of oxygen consumption determines ATP production which is crucial for the ability of the ß-cell to respond to high glucose with insulin secretion. The INS-1 832/2, which express LDH, have regained their ability to speed up glycolysis to reflect energy demands and substrate levels. This gives them an advantage as it makes them less vulnerable but occurs at the expense of ß-cell functionality, such as their ability to secrete insulin in response to glucose.

No conflict of interest

D-0796

Development of an in silico model to extrapolate whole body glucose – insulin homeostasis by altering tissue specific effects, simulation of SGLT-2 inhibition in type 2 diabetes

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Aims: The inhibition of gut and renal sodium-glucose co-transporters (SGLTs) has been proposed as a novel therapeutic approach for the treatment of diabetes. SGLT-2 inhibitors acutely induce renal glucose excretion by a change in the renal threshold.

Homeostatic Model Assessment (HOMA) is a model based on the interaction of organs or tissues represented by equations derived from empirical data. It has become an international standard for measuring beta-cell function and insulin resistance in large studies where detailed physiology is not possible. We have developed an interactive Homeostatic Model of Assessment (iHOMA) in which the parameters of the individual models are modifiable through an onscreen interface using visual analogue controls. The iHOMA model can be used for *in silico* calculations of the specific effects drugs may have on glucose metabolism.

The aim was to mathematically model the effect of an SGLT-2 inhibitor in patients with Type 2 diabetes (T2DM) using the iHOMA program.

Methods: A total of 428 patients (239 Male) with T2DM were retrospectively analysed from the Diabetes in Families (DIF) study. The DIF study was a population-based collection of patients with T2DM and their siblings sampled from GP practices in Oxfordshire and Northamptonshire. Although patients were on a variety of drugs none of these were likely to interfere with their renal glucose excretion. They had a mean BMI 30.4 (±5.6) kg/m^2, mean age 62(±11) years, mean HbA1c 7.9 (±1.6), mean Fasting Plasma Glucose(FPG) of 9.6 (±3.1) mmol/l and geometric mean Fasting Plasma Insulin (FPI) of 112.0 (range 65.8 – 190.5) pmol/l.

iHOMA was developed by the authors at the University of Oxford and has been validated against the original HOMA algorithms. iHOMA was used to mathematically simulate the effect of an SGLT-2 inhibitor by decreasing the renal glucose excretion threshold by 50%. FPG and FPI were then calculated for each subject using iHOMA adjusted for these.

Results: Using iHOMA, which can account for tissue-specific glucose metabolism effect, the simulated whole body effect by altering renal excretion of glucose was moderate. A paired-sample t-test revealed a significant difference in the mean FPG (9.6 vs. 8.9, $p<0.01$) mmol/l a decrease of 0.7 mmol/l. The FPG change in concentration was accompanied by a change in the geometric mean FPI (112.0 vs. 99.3, $p<0.01$) pmol/l a decrease of 12.7 pmol/l.

Conclusion: The development of iHOMA enables the investigation of pharmacological effects of a novel therapy on glucose metabolism *in silico.* The model suggests that SGLT-2 inhibitors have the potential to effect a moderate change in glucose in people with T2DM. However, it is important that these data are replicated and validated in a prospective randomised control trial.

No conflict of interest

LIVING WITH DIABETES

Psychosocial issues and lifestyle

D-0797

Nocturnal hypoglycemia in children with type 1 diabetes is associated with increased incidence of anxiety and depression symptoms in the parents: a population-based study

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Background: Parenting children with a chronic disease such as diabetes has been shown to be a risk factor for increased level of parental emotional distress.

Aim: The aim of this study was to analyze associations between factors related to the child with diabetes and emotional distress in the parents. We hypothesized that higher frequency of hypoglycemic events, experience with nocturnal hypoglycemia or hypoglycemia with unconsciousness, higher

frequency of blood glucose measurements, higher level of HbA1c, lower age in the child and shorter diabetes duration were associated with increased level of anxiety and depression symptoms in the parents.

Sample and method: Mothers (103) and fathers (97) of 115 children with type 1 diabetes participated in this population-based survey which included parents of close to all children (1-15 yrs) with type 1 diabetes in the current Norwegian county (response rate: 72%). To assess emotional distress the Hopkins Symptom Checklist-25-item questionnaire (HSCL-25) measuring the presence and intensity of anxiety and depression symptoms during the previous two weeks, was used. Total HSCL-25 score is rated from 1 to 4 and cutoff for symptomatic mental problems is set at a score >=1.75. To test the hypothesis, the generalized estimating equations procedure for regression models with correlated data was used (R package gee).

Results: Mean age of the 115 children was 10.6 yrs (range 1.6-15.9), mean diabetes duration 3.9 yrs (0.3-14.2) and mean HbA1c level 8.1% (SD 1.03). The parents of 69% of the children reported that they have experienced nocturnal hypoglycaemia in their child at least once, while parents of 21% reported that they have experienced hypoglycaemia with unconsciousness at least once. The parents of 87% of the children reported >=4 blood glucose measurements/day and parents of 27% reported to measure during the night at least once a week. The analysis showed a significant association between a higher HSCL-25 score and experience with nocturnal hypoglycemia (regr coeff 0.11, P =0.012). In addition, the analysis showed significant associations between a higher HSCL-25 score and a shorter diabetes duration (regr coeff 0.02, P =0.035) and a higher age in the child (regr coeff 0.02, P =0.015). The mothers had a significantly higher HSCL-25 score compared to the fathers (regr coeff 0.12, P <0.001, mean score 1.39 vs 1.22).

Conclusion: In addition to shorter diabetes duration, nocturnal hypoglycemia in children with type 1 diabetes seems to be an important risk factor for increased level of anxiety and depression symptoms in the parents. The findings highlight the importance of appropriate strategies to prevent hypoglycaemia in children with type 1 diabetes.

No conflict of interest

D-0798

Relationship between diabetes long-term duration and health-related quality of life - a Swedish Population Based Study

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Background: Between four to five percent of the Swedish population have diabetes mellitus, a life-long disease that may affect both length of life and health-related quality of life (HRQoL). We hypothesise that HRQoL eight years after diagnosis, when the disease is more stable and the negative effect on HRQoL during the early phase of diabetes has decreased. Long-term complications are likely to appear 15 years after diagnosis, after 24 years the prevalence of these complications are considerable which may negatively affect HRQoL.

Aim: This study aims to describe HRQoL using the generic EQ-5D in a diabetes population 8, 15 and 24 years after diagnosis to investigate the relationship between disease duration and self-assessed health status.

Methods: Since 1983, the Diabetes Incidence Study in Sweden (DISS) prospectively registers all incident cases of diabetes mellitus in the age group 15-34 years. In this study, three cohorts were selected from DISS and two controls per case randomly selected from the general population, matched by age, sex and county of residence. Data were collected 2007 by postal questionnaires to the three diabetes cohorts (response rate was 57.7%, n=721) and controls (response rate 54.8%, n=1360). EQ-5D, measuring health status on five dimensions (mobility; self-care; usual activities; pain/discomfort; anxiety/depression) in three levels of severity, was included in the survey. EQ VAS records overall self-rated health on a 0-100 visual analogue scale. EQ-5D index (1=full health; 0=dead) was calculated.

Results: Having no problem on any EQ-5D dimension was rated by 44.5%, 47.1% and 33.2% of the cases 8, 15 and 24 years after diagnosis, respectively. Corresponding figures for controls were 52.9%, 46.0% and 42.3%. Most problems were reported on the dimension pain/discomfort: 37.8%, 40.5% and 56.6% of the cases compared to 34.5%, 41.7% and 50.1% of the controls. Problems on anxiety/depression dimension were reported by 36.4%, 35.1% and 40.3% of the cases compared to 27.1%, 33.6% and 30.7% of the controls. Lowest percentage of problems was reported in the dimension self-care. Mean EQ-5D index value for the cases was 0.87, 0.82 and 0.77 and for the controls 0.88, 0.84 and 0.82, respectively. Mean EQ VAS for the cases was 78.5, 75.9 and 72.9 and for the controls 83.7, 87.2 and 80.1.

Discussion: The gap between cases and controls was widening with disease duration suggesting that HRQoL was related not only to age but also to long-term duration of diabetes. As HRQoL is likely to be negatively affected by the intensified counselling and treatment efforts in early diabetes, data are currently collected on a diabetes population one year after diagnosis. Investments in the early phases may have a positive effect on not only HRQoL but also costs in a long-term perspective.

No conflict of interest

D-0799

Conflicts between personal self-regulating goals and life values among adults with type 2 diabetes

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Background: It is well documented that goals and values have a significant impact on motivation and play a crucial role in understanding self-regulating behavior. Little is, however, known about how life values and personal goals for self-regulation among adults with type 2 diabetes may compete, and thus influence motivation.

Aim: The aim of this study is to describe how goals for personal self-regulation may compete with other life values among adults with type 2 diabetes.

Design and methods: This study was conducted as a pilot study prior to a Norwegian national longitudinal, prospective survey. A descriptive/explorative qualitative design that includes focus groups was used to collect data. The sample consisted of 19 adults included in the study. The participants, aged between 30 and 65 years, with disease duration of at least one year and able to speak Norwegian, were included in the study. They were recruited from three separate sources in south-western part of Norway: 1) The Coping and Learning Centre at a University hospital, 2) a local Diabetes Association and 3) general practitioners (GPs). The participants were divided into three focus groups, and the interviews took form of two sessions. Two main topics were addressed: 1) Personal goals for self-regulation of diabetes and 2) life values that may compete with goals for self-regulation. Data were analyzed using qualitative content analysis.

Results: Findings revealed personal goals for self-regulation as more general than specific. Moreover, six themes of conflicts between life values and personal goals for self-regulation emerged: 1) value of bodily well-being (e.g. perceiving exercise as too demanding), 2) value of belonging (e.g. being stigmatized), 3) value of work performance (e.g. work demands interfere with self-regulation), 4) value of presenting a positive body image (e.g. feeling uncomfortable in displaying their body in exercise situations, 5) value of self-determination (e.g. high value of self-determination makes one ignore advice for self-regulation) and 6) value of engaging in activities of interest (e.g. preferring non-physical activities).

Conclusions: The findings indicate that personal goals for optimal self-regulation were formulated in more general than specific terms, something that may lead to low motivation for optimal self-regulation. Moreover, the participants' life values seemed often to compete with the requirements on adequate self-regulation, which, in turn, may have influenced their motivation for attaining personal goals for self-regulation.

No conflict of interest

D-0800

Factors associated with depression and anxiety disorder in diabetic patients in Turkey

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Objective: The aim of this study was to describe the factors associated with depression and anxiety in diabetic patients in Turkey

Method: 219 diabetic patients (F/M: 133/86, age: 56 ± 13.68 yrs) who had been treated at the endocrinology outpatient unit were analyzed. At their last visits, demographic and anthropometric features, educational levels, occupations, marital and economic statuses, social problems, treatment periods, applied medications, fasting and postprandial glucose measures,

A1C levels and diabetic complications of the patients were recorded. Patients completed The Hospital Anxiety and Depression Scale (HADS) while waiting for their routine outpatient appointment.

Results: 200 type 2 and 19 type 1 diabetic patients were included in the study. 125 (57.1%) patients had depression, 113 (51.6%) had anxiety disorder and 87 (39.7%) of the them had both depression and anxiety disorder. There was no difference among the types of diabetes for depression or anxiety status. Logistic regression analyses demonstrated that high educational level (> 8 years) and social problems were found to be statistically significant risk factors associated with anxiety and depression. Furthermore, male sex was found to be a major risk factor only for anxiety disorder in Turkish diabetic patients (table 1).

Table 1 Logistic regression analyses of risk factors

Risk Factors for Anxiety Disorder	Adjusted odds ratio	95% CI for OR		p
		Lower	Upper	
Male sex	5.42	2.56	11.47	<0.001
Educational level	2.98	1.45	6.11	0.003
Social problems	0.15	0.07	0.30	<0.001
Risk Factors for Depression				
Educational level	3.64	2.02	6.55	<0.001
Social problems	0.50	0.28	0.91	0.022
CI: Confidence interval, OR: Odds ratio				

Conclusion: In Turkish diabetic patients, especially with male sex, high educational level and social problems are significant risk factors for mood disorders. Therefore, this group of patients should be considered for psychologic support.

No conflict of interest

D-0801

New diabetic patient, new views of life

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Aims: The aim of the study was to explore the relationship between new experiences and psychological repercussions about the new diabetic diagnosis on a woman, and her role in diabetes education treatment.

Methods: Qualitative, exploratory study. One new Patient was interviewed in the Diabetic Education Nurse Consultation using semi-structured questions on illness history, coping strategies, perceived barriers to care, the illness, and its management.

Results: The findings have implications for, and are discussed in relation to, issues of control, regimen adherence, and what it means to be a 'good' or 'successful' diabetic. The goal of patient was to integrate the control of their diabetes into daily life. This involved an emphasis on the way the new patient viewed her role in diabetes management. Furthermore, her attitude towards diabetes treatment was variable, and she changed her views and switched categories when she realized she improved her capillary glycaemic control and her quality of life perceptions after working according to the Diabetic Education Nurse Consultation.

Conclusion: From the perspective of Diabetic Education Nurse Consultation, it is important to know how the person with diabetes perceives his/her role in disease management and to determine if a change in perception would be followed by intervention to adjust glycaemic control. The satisfaction of personal goals and a focus on psychological as well as physical health may be very important if positive quality of life outcomes are to be attained in the context of Type 2 diabetes. Consequently, individuals' perception of disease management should be incorporated in patient education programmes and routine diabetes cares to enable customized care and prevent stagnation in negative roles.

No conflict of interest

D-0802

Factors that interfere with quality of life with diabetes: patients' views

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The number of people with Diabetes Mellitus (DM) has been increasing due to an inappropriate lifestyle, highlights are physical inactivity and a non-healthy diet that lead to a decreased quality of life (QOL). The study was done using a semi-structured questionnaire designed to this search, taking as reference the WHOQOL-BREF and DQOL. The sample of 80 individuals with the average age of 60 years (± 13), 66.25% were women, 87.5% type 2 diabetes, average of 11 years (± 8) of diagnosis, 67.5% were using the public health system. The nutritionist was the professional most quoted in the monitoring process of diabetes by 48.75%. The diet and physical activity was quoted by 80% and 70% respectively as part of treatment. In addition to data from their personal profile, the respondents were asked to spontaneously list the factors that interfere in their QOL; after that the questions with specific variables were presented. In these questions there was an interval scale with numbers from 1 to 5. The numbers corresponded to the degree of interference of variable (interferes nothing to interferes a lot) in QOL of the patients. The factors most mentioned spontaneously were: eating 25%, financial situation and domestic problems 22.5%, stress 17.5% and the care with health and with diabetes 12.5%. The least mentioned were: daily injections, blood glucose control, have to do exams and need to be more reserved with 1.5%. Among the specific variables suggested, the most important were: care with eating, financial situation, physical activities, being a diabetic and pain. The least mentioned were: family relationships, physical aesthetics, attitudes of other individuals, free time. Many questions had a great diversity of responses, in which opposing categories were much cited. In these questions it was tried to find out what characteristics were decisive in these cases. Thus, it is important to note that the individuality, the education on diabetes, the support of family and interdisciplinary work are points that should be noted on the work with individuals with diabetes.

No conflict of interest

D-0803

Type 1 diabetes and early school wastage among Congolese diabetic children

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Aim: To determine the frequency and leading causes of school wastage among Congolese children with type 1 diabetes.

Methods: A cross-sectionnal study was perfomed in a population of type 1 diabetic Congolese children between December 2007 and July 2008. The study was conducted in the diabetic clinic of Boyambi Centre, a primary health care centre. All patients underwent a routine ophthalmologic examination after an interview with a pre-established questionnaire.

Results: 212 diabetic children were included in this study. There were 127 (59.9%) girls and 85 (40.1%) boys. Mean age was 19.7±SD5.23 years (range from 9 to 38 years). At the time of the diabetes diagnosis, mean age was 15 years±0 (range from 4 to 29 years). Mean diabetes duration was 4.65 years±SD3.7 (range from 0 to 20 years).

There was 56.1% of school wastage from this whole of children; 65% of them did not complete their primary school, 30.7% reached the secondary level and 4.2% completed their secondary level school. Psychologic repercussions of diabetes was the leading cause of the school wastage (58.1%). The others causes were: poverty (38.7%), family conflicts (2.7%) and visual impairment (0.5%).

From the whole of all children included in this study, 51.9% were not living under guardianship of their parents (father or mother); 26.4% of them took themselves under their wing and did odd jobs to survive; 23.6% have a tutor from their family and 1.9% were under guardianship of alms-houses.

Conclusion: Psychologic repercussions of type 1 diabetes seems to be a leading cause of early school wastage. This needs to associate psychologic counselling in type 1 diabetes cares in developing countries.

No conflict of interest

D-0804

Diabetes shockers – short films to raise diabetes awareness in an indigenous community

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Aims: Short films were used to document experiences of people living with type 2 diabetes in order to raise awareness on the impacts of diabetes, and to support diabetes prevention. The films, produced entirely by a community diabetes prevention project, bring to the forefront the often untold impact of diabetes on the families and individuals living with diabetes.
Methods: The Kahnawake Schools Diabetes Prevention Project (KSDPP) is a community-directed research and intervention project aiming to prevent type 2 diabetes in the Mohawk community of Kahnawake, near Montreal, Canada. In 2006 an elder, who is also a member on the KSDPP community advisory board, proposed documenting his experiences with dialysis as a way to raise awareness in the community about the complications of diabetes.
Results: The project developed into a collection of four short films, each focusing on an aspect of the impacts of type 2 diabetes; (1) "Living with Diabetes" – Three individuals tell their stories about how diabetes affects daily living (2) "Dealing with Reality" – a young woman discusses recently being diagnosed with type 2 diabetes (3) "The Effects on a Family" – a family coming to terms with the death of a young parent due to diabetes complications (4) "Damage Control" - filmed during his dialysis treatmen,t an elder reflects on how diabetes has affected him.
Conclusion: The films were effective educational tools for raising awareness about living with diabetes in Kahnawake, and they re-emphasized the importance of primary prevention of this disease. They are available to buy on a DVD at www.ksdpp.org

No conflict of interest

D-0805

Risk factors for developing type 2 diabetes: awareness amongst the public and healthcare staff

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Aim: To determine the awareness of risk factors which predispose one to Type 2 diabetes (DM) amongst the Public (PB) as well as Healthcare staff (HCS).
Methodology: The subjects were recruited from a public health screening event. The participating subjects were shown ten risk factors associated with DM. The risk factors included were: ethnicity, high BMI, hypertension, family history (FH) of DM, sedentary lifestyle, older age, high-calorie diet, medication, high-stress level and previous gestational diabetes mellitus.
The questionnaires were conducted by volunteers during a public health screening event, and self-administered questionnaires by healthcare staff. A 4-parameter beta regression model was applied to analyse how the factors were associated with the overall score of DM risk perception (permissible range: 0—10). Analysed with Stata 10.0, all statistical tests were conducted at 5% level of significance.
Results: A total of 695 respondents participated in the survey. A typical respondent was a Chinese female (46.9%) with a mean age of 48 (s.d.: 15.2). The average score of DM risk awareness was 7.35 (s.d.: 1.85). 26.6% were HCS and the mean scores of DM risk perception were 7.25 (s.d.: 1.77) for HCS and 7.41 (s.d.: 1.87) for PB. There was no significant difference in risk perception between HCS and PB after adjusting for educational attainment, gender, age, ethnicity, marital status, DM status and FH of DM. HCS & PB who had a FH of DM were more aware of the risks associated with DM.
Conclusion: PB and HCS were generally aware of the risk factors for DM. Educational activities should be continued to promote and increase awareness of risk factors associated with DM.

No conflict of interest

CLINICAL RESEARCH

Complications - dyslipidemia

D-0806

Endothelial lipase and reverse cholesterol transport in type 2 diabetes mellitus

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Aims: Endothelial lipase (EL) is a phospholipase with little triacylglycerol lipase activity and plays an important role in the metabolism of HDL. Modulation of HDL by EL may affect reverse cholesterol transport. We have investigated whether serum EL concentration is associated with changes in the serum capacity to induce cholesterol efflux in patients with type 2 diabetes mellitus.
Methods: 172 diabetic patients and 175 controls were recruited. Serum EL was measured by ELISA and cholesterol efflux to serum was determined by measuring the transfer of [3H]cholesterol from Fu5AH cells to the medium containing the tested serum.
Results: Diabetic patients had significantly higher plasma triglyceride ($p<0.01$), lower HDL cholesterol ($p<0.01$) and elevated high sensitivity C-reactive protein (CRP) ($p<0.01$) compared to the controls. Serum EL was significantly increased in the diabetic patients (27.7 ± 16.6 ng/ml vs 24.0 ± 11.3 respectively, $p<0.05$) and cholesterol efflux to serum was impaired (15.1 ± 2.5% vs 16.7 ± 3.1 respectively, $p<0.01$). In the control subjects, serum EL correlated inversely with cholesterol efflux to serum ($r=-0.16$, $p=0.03$) but no significant association was seen in the diabetic patients. Linear regression shows that in the controls, plasma HDL, serum EL and waist circumference were the major independent determinants of cholesterol efflux to serum whereas in the diabetic cohort, the major independent determinants of cholesterol efflux to serum were HDL, age and CRP.
Conclusion: Although serum EL concentration was increased in type 2 diabetic patients, impaired serum capacity to induce cholesterol efflux was mainly related to low HDL and subclinical inflammation in these patients.

No conflict of interest

D-0807

Aspirin reduces transient flushing and glucose increases during therapy with niacin extended-release

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Aims: Proprietary niacin extended-release reduces most pro-atherogenic lipids while increasing anti-atherogenic lipids. In addition to flushing, therapy with niacin has been associated with a transient increase in blood glucose levels, although long-term effects on HbA1c are not usually observed. Both flushing and increases in blood glucose may be mediated via associated pathways. Since aspirin has been demonstrated to mitigate flushing during adaptation to niacin extended-release therapy, we evaluated the effects of aspirin on changes in blood glucose in patients with mixed dyslipidemia treated with niacin extended-release.
Methods: Data are from a double-blind, parallel group, multi-center, placebo-controlled study. Patients were randomized to receive niacin extended-release (500 mg/day week 1; 1000 mg/day week 2; 2000 mg/day weeks 3-6) and either 325 mg/day aspirin (n = 90) or placebo (n = 90). Both maximum severity of flushing [1- to 10-point scale] and the mean % change from baseline in fasting blood glucose were compared between the two treatment groups using one-way analysis of variance.
Results: Over the entire 6 weeks of treatment, aspirin reduced mean maximum flushing severity by 33% (3.5 aspirin vs 5.2 placebo; $P < 0.001$). Baseline fasting blood glucose levels were similar for both groups (niacin extended-release + aspirin, 109.1 mg/dL, niacin extended-release + placebo, 107.3 mg/dL, $P = 0.66$). Aspirin use reduced the magnitude of the increase in fasting blood glucose by 55%. The mean % increases in fasting blood glucose over the 6 weeks of treatment were 5.6 ± 17.7, with aspirin, and 12.5 ± 25.2, with placebo, $P = 0.03$.

Conclusions: Among patients with mixed dyslipidemia, aspirin effectively mitigates flushing symptoms during adaptation to niacin extended-release therapy. Treatment with aspirin may also reduce the magnitude of the increase in fasting blood glucose associated with niacin extended-release therapy.

Conflict of interest:
Paid lecturing: HA Punzi (Abbott, Forest, BI, BMS).
MH Davidson (Abbott Laboratories, AstraZeneca Pharmaceuticals, Daiichi-Sankyo, Inc., diaDexus, Inc., GlaxoSmithKline, Merck & Co., Inc., Merck/Schering-Plough, and Takeda Pharmaceuticals)
Stock ownership: RJ Padley, RB Thakkar, P Jiang, and SL Krause (Abbott).
Advisory board: HA Punzi (Forest).
MH Davidson (Abbott Laboratories, AstraZeneca Pharmaceuticals, Daiichi-Sankyo, Inc., GlaxoSmithKline, Kinemed, Merck & Co., Inc., Merck/Schering-Plough, Roche Pharmaceuticals, and Takeda Pharmaceuticals)
Employee: RJ Padley, RB Thakkar, P Jiang, and SL Krause (Abbott)
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MH Davidson (Abbott Laboratories, AstraZeneca Pharmaceuticals, Daiichi-Sankyo, Inc., Merck & Co., Inc., Merck/Schering-Plough, Pfizer Laboratories, Roche Pharmaceuticals, and Takeda Pharmaceuticals)
Other substantive relationships: Consultant: MH Davidson (Abbott Laboratories, AcademicCME, AstraZeneca Pharmaceuticals, Daiichi-Sankyo, Inc., diaDexus, Inc., GlaxoSmithKline, Merck & Co., Inc., Merck/Schering-Plough, Omthera, Pfizer Laboratories, Roche Pharmaceuticals, sanofi-aventis, Synarc, and Takeda Pharmaceuticals, Vindico)

D-0808

Adiponectin is an independent predictor of apolipoprotein B/A1 ratio in Korean impaired fasting glucose patients

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Recent studies have reported that Apolipoprotein B/A1 ratio is a better predictor of atherosclerotic vascular disease compared to LDL-C. The aim of this study was to assess the association of serum Apolipoprotein B/A1 ratio with insulin resistance and PWV in patients with impaired fasting glucose (IFG). 658 subjects with fasting plasma glucose level of between 100 and 125 mg/dl and without a history of diabetes were enrolled in this study. BMI, WC, and serum concentration of apolipoprotein B, apolipoprotein A1, glucose, lipids (triglycerides, LDL cholesterol, HDL cholesterol, and total cholesterol) were measured. Insulin resistance was estimated by the insulin resistance index of homeostasis model assessment (HOMA-IR) & serum adiponectin. PWV was evaluated to assess arterial stiffness.
Apolipoprotein B/A1 ratio significantly correlated with total cholesterol (r=0.288, P<0.01), TG (r=0.130, P<0.01), LDL-C (r=0.394, P<0.01), HDL-C (r= -0.336, P<0.01), adiponectin (r= -0.149, P<0.01), HOMA-IR (r=0.081, P=0.037), insulin (r=0.082, P=0.041), BMI (r=0.083, P=0.03), WC(r=0.092, P=0.02), and peripheral PWV (r=0.088, P=0.042). Multiple regression analysis showed that Apolipoprotein B/A1 ratio was significantly associated with total cholesterol (ß=0.179, P<0.01), LDL-C (ß=0.120, P<0.01), HDL-C (ß= -0.184, P<0.01), and adiponectin (ß= -0.135, P=0.03).
In conclusion, apolipoprotein B/A1 ratio is significantly associated with insulin resistance, and serum adiponectin is an important independent factor associated with Apolipoprotein B/A1 ratio in Korean IFG patients.

Conflict of interest:
Commercially-sponsored research: C. Ahn
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D-0809

Perilipin, IL-1, ADRB and MCR-4 gene variants identify bariatric surgery patients who are predisposed to dyslipidemia

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There are many comorbidities of obesity including diabetes, hypertension, cardiovascular disease and stroke. Dyslipidemia is an underlying causative factor in many of these comorbidities. Obese subjects with dyslipidemia are at a greater risk than those with normal blood lipid profiles and require rigorous medical management. Several genetic variants associated with obesity are in the genes that regulate satiety or fat and carbohydrate metabolism or inflammation. Although the mechanism of obesity-induced insulin resistance and type2 diabetes is not fully understood, tissue stress and/or abnormal infiltration of macrophages in adipose tissues is known to trigger an inflammatory response. Therefore, in an effort to understand if genetic variants in some of these obesity-related genes are associated with abnormal lipid metabolism we conducted a study on 824 obese subjects enrolled in a preoperative bariatric surgery program at the Geisinger Clinic. These patients were medically managed for a 6-8 month period in an effort to lose 5-10% of their body weight to decrease the incidence of perioperative complications. Body weight and blood lipids were measured at baseline before subjects went on a preoperative weight loss program. We genotyped DNA from 824 subjects who had consented to genetic analysis. A total of 23 SNPs in 9 genes (IL1A, IL1B, IL1RN, Perilipin, ADRB2, ADRB3, FABP2, PPARg, MCR-4) either previously associated with obesity and/or involved in the regulation of inflammation or metabolism/absorption of fat and carbohydrate, or satiety were investigated for association with abnormal levels of HDL, LDL, and triglycerides at baseline using linear regression analysis. Polymorphisms within the ADRB2 (ß= -1.651; p= 0.0275), MCR-4 (ß= -2.838; p= 0.008) genes, and IL1B gene promoter (ß= -2.687; p = 0.014) were strongly associated with lower HDL levels after adjusting for age, gender, metabolic score (scoring the metabolic comorbidities) and antidepression medications. The PLIN1 SNP in the perilipin gene (ß= 8.693; p=0.0231) was associated with higher levels of LDL after adjusting for age, gender, diabetes and cholesterol medications. IL1B (ß= 0.1558; p=0.027), IL1RN (ß= 0.254; p= 0.0138) and perilipin (ß = 0.1364; p= 0.008) genes were strongly associated with higher levels of triglycerides (log transformed). FABP2, PPARg, ADRB3 and IL1A genes were not associated with dyslipidemia. We suggest that these associated genetic polymorphisms may confer susceptibility to abnormal levels of blood lipids and could have clinical utility in the identification and management of obese patients.

Conflict of interest:
Stock ownership: Kornman, K., Interleukin Genetics
Employee: Aziz, N., Kondragunta, V., Prabhakar, P. Shaver, K. Interleukin Genetics

D-0810

Apolipoprotein B levels in adults with type 1 diabetes not receiving lipid-lowering therapy

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Objective: Cardiovascular disease (CVD) is the leading cause of death in patients with type 1 diabetes (T1D). Apolipoprotein B (apoB) has been shown to be a better marker of CVD risk and response to lipid-lowering therapy than LDL cholesterol (LDL-C). This study investigated apoB levels in 169 consecutive, consenting, adult patients with T1D with no previous history of CVD and not receiving lipid-lowering therapy.
Research design: Subjects were divided into two groups: males (M) and females (F). Primary analysis examined lipid parameters. Secondary analysis involved classifying patients according to the Canadian Diabetes Association's (CDA) LDL-C and apoB targets of 2.0 mmol/L and 0.90 g/L respectively.

Results:

Table 1: Demographic and clinical characteristics of the study population.

	M (n=90)	F (n=79)
Age (years)	46.6 ± 12.5	47.4 ± 14.5
Duration of DM (years)	23.3 ± 12.0	22.9 ± 12.4
Age of Onset	23.3 ± 11.1	24.5 ± 13.1
Weight (kg)	82.9 ± 13.6	67.3 ± 12.3
Hb A1C (%)	7.8 ± 1.3	8.0 ± 1.4
Blood pressure (mmHg)	122.3 ± 17.5/71.0 ± 8.7	118.8 ± 15.7/70.3 ± 6.9
Total cholesterol (mmol/L)	4.6 ± 0.9	4.8 ± 0.8
HDL-C (mmol/L)	1.6 ± 0.4	1.9† ± 0.5
LDL-C (mmol/L)	2.6 ± 0.7	2.5 ± 0.7
Triglyceride (mmol/L)	0.88 ± 0.5	0.86 ± 0.5
Cholesterol:HDL-C	3.1 ± 0.9	2.7‡ ± 0.7
ApoB (g/L)	0.81* ± 0.17	0.78* ± 0.18
ApoB (g/L) with TG<1.5 (mmol/L)	0.79 ± 0.17	0.77 ± 0.17
ApoB (g/L) with TG=1.5 (mmol/L)	0.94 ± 0.15	0.92 ± 0.22
Data are shown as means ± SD.		
*Significantly lower than 1.2 g/L (p < 0.0001) and 0.90 g/L (p < 0.0001).		
†Significantly higher in F than M, p < 0.0001.		
‡ Significantly lower in F than M, p < 0.001.		

We found that the prevalence of elevated apoB is low among all patients with T1D and the level of HDL-C was significantly higher in females. We also found that among patients who failed to achieve the CDA LDL-C target, 62% of males and 66% of females met the apoB target. Proportions of individuals who were categorized as above LDL-C and apoB targets were significantly different in both groups (p < 0.0001).

Table 2. Patients classified according to the LDL-C target and assessed based on apoB target of 0.90 g/L, McNemar's test p-values for the LDL-C and apoB targets are shown

	M		F	
	apoB<0.90g/L	apoB=0.90g/L	apoB<0.90g/L	apoB=0.90g/L
LDL-C=2.0mmol/L	16 (100%)	0	15 (100%)	0
LDL-C>2.0mmol/L	46 (62%)	28 (38%)	42 (66%)	22 (34%)
p-value	< 0.0001		< 0.0001	

Conclusion: The low prevalence of dyslipidemia among patients with T1D may indicate that other factors such as poor glycemic control may be responsible for the increased risk of death due to CVD. In addition, there is discordance between the proportions of patients meeting either LDL-C or apoB targets. Approximately 18% of patients met CDA's LDL-C target while more than 70% met the apoB target, thus a significant number of patients may be prescribed lipid-lowering medications unnecessarily.

No conflict of interest

D-0811

Lipoprotein (a) levels in black South Africans are not associated with metabolic characteristics

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Background: Lp(a) plays a role in the atherosclerotic process and several retrospective studies have indicated that elevated Lp(a) concentrations are a strong independent risk factor for premature heart disease, cerebrovascular and peripheral vascular disease and early occlusion of coronary artery bypass grafts and femoropopliteal vein grafts. However, mean and median Lp(a) levels vary considerably among populations.

Methods: Fasting blood samples of 327 participants were analysed for blood glucose, lipids and lipoproteins using standard methods (Beckman SGX5). Lp(a) was assayed by immunonephelometry with a commercial kit using anti-Lp(a) antibodies.

Results: Obesity was present in 23.2% of all cases, and it was significantly higher in females than males, 52.4% and 9.5% respectively, p< 0.001. Because the distribution of the serum Lp(a) values was skewed, these were log-transformed. The 75th percentile for males was located at 40.8 mg/dL and for females at 41.0 mg/dL. No correlations were observed between Lp(a) levels and age, BMI, WHR, LDL-cholesterol, HDL-cholesterol, triglycerides and blood pressure. Using the 75th percentile to indicate hyper-Lp(a)-aemia and possibly increased atherogenic risk, 25% of our subjects were classified into this category and had significantly higher total cholesterol levels.

Conclusion: In contrast to observations made in Nigerian blacks, Lp(a) levels though also high, were not influenced by either sex, age, BMI, WHR, BP, or LDL-cholesterol concentrations. Our results confirm that high serum Lp(a) levels seem to be characteristic of all black populations studied, however in black South Africans these values do not seem to be influenced by metabolic factors, therefore the role of genetic factors needs to be investigated. Furthermore, cut-off values indicative of increased atherogenic risk need to be developed for black populations since the 30 mg/dl used may not be applicable to this population group that already has high serum Lp(a) levels.

No conflict of interest

D-0812

Characteristics of statin-treated patients with diabetes mellitus in Europe and Canada: results of the Dyslipidemia International Study

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Background and aims: This study was designed to explore the dyslipidemia still present in statin-treated patients with diabetes, along with the characteristics of co-morbid conditions that provide additional risk of cardiovascular events.

Materials and methods: DYSIS was a cross-sectional epidemiology study conducted in 11 European countries and Canada. Patients were consecutively recruited from the practices of 2987 general practitioners, cardiologists, endocrinologists/diabetologists and internists. Inclusion criteria included: ≥ 45 yrs of age, statin treatment for ≥ 3 months, a clinical exam and a record of ≥ one lipid value.

Results: Between April 2008 and February 2009, 22,063 patients were enrolled. Of these, 19,196 had full lipid values. Patients with diabetes represented 39.5% of that population. 58.5% were at LDL-C goal. Of those not at LDL-C goal, 16.2% had normal HDL-C and TGs. 3.9% had high TGs, 8.3% had low HDL-C with high TGs and 3.2% had low HDL-C. 25.4% had low HDL-C and/or high TGs.

Conclusions: Despite statin therapy, patients with diabetes potentially remain at high risk for CV events. Of note are several additional modifiable risk factors: a sedentary lifestyle, hypertension, and obesity. Most of these patients have the metabolic syndrome and are candidates for an intensive lipid and lifestyle management program.

Patient Characteristic	Patients with DM N = 8613 (39.0%)
Age (years, ± SD)	66.3 (± 9.4)
Female (%)	41.2%
Sedentary Lifestyle (%)	54.9%
HTN (%)	84.7%
Current smoker (%)	14.6%
Ischemic Ht Disease (%)	35.5%
BMI>=30 kg/m2	46.4%
CVD (%)(CHD, CV dis, HF a/o PAD)	47.5%
Heart Failure (%)	11.2%
PAD (%)	12.8%
Cerebrovascular disease	10.3%
MetS (ATPIII) (%)	76.5%
MetS (IDF GL) (%)	86.8%
Parental Hx DM (%)	47.0%
Mean HbA1C (DM only)	7.0+/-1.2
Fasting glucose (mean)	137.7 +/-41.7

No conflict of interest

D-0813

Efficacy of fenofibric acid in combination with simvastatin in patients with type 2 diabetes mellitus and mixed dyslipidemia

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Background: Patients with type 2 diabetes mellitus (T2DM) are at high risk for coronary heart disease and frequently have mixed dyslipidemia (high triglycerides, low HDL-C and elevated LDL-C), which may be refractory to single-agent lipid-altering therapy. This pre-planned analysis of a multicenter, double-blind phase 3 study of patients with mixed dyslipidemia evaluates the efficacy of the combination of fenofibric acid (FA) and simvastatin (S) on multiple lipid parameters in a subgroup of patients with T2DM.
Methods: A total of 657 patients with LDL-C ≥ 130 mg/dL (3.36 mmol/L), triglycerides ≥ 150 mg/dL (1.70 mmol/L) and HDL-C < 40 mg/dL (1.03 mmol/L) for men (< 50 mg/dL [1.29 mmol/L] for women) were randomized to either FA 135 mg, S (20, 40 or 80 mg) or combination therapy (FA+S20 or 40 mg) and treated for 12 weeks. A total of 142 (22.9%) of the 621 patients included in the primary efficacy analysis had T2DM. The primary efficacy comparisons were mean % changes in HDL-C and triglycerides (FA+S vs. S) and LDL-C (FA+S vs. FA). Secondary endpoints included mean % changes in non HDL-C and apolipoprotein B (FA+S vs. S).
Results: All treatments improved multiple lipid parameters (Table). FA+S resulted in greater improvement in triglycerides than the equivalent S monotherapy, dose and greater improvements in LDL-C than FA monotherapy. FA+S20mg also resulted in a greater improvement in HDL-C, non-HDL-C and apolipoprotein B than S20mg. All treatments were generally well tolerated and no case of rhabdomyolysis was reported.

	FA	S20	FA +S20	P-Value	S40	FA+ S40	P-Value
HDL-C	n=26	n=24	n=25		n=21	n=26	
BL	36.6	39.1	38.6		39.7	39.0	
Final	42.2	40.0	44.2	0.017	43.0	44.8	0.16
Mean % change	+14.7	+2.9	+15.2		+9.1	+16.5	
SE	3.51	3.63	3.55		3.88	3.49	
TG	n=27	n=25	n=25		n=25	n=27	
BL	335.8	272.6	288.3		304.0	267.0	
Final	192.8	251.3	156.7	<0.001	213.5	141.0	0.028
Mean % change	-31.3	-3.8	-40.4		-28.5	-44.8	
SE	5.12	5.29	5.28		5.29	5.10	
LDL-C	n=26	n=25	n=25		n=22	n=26	
BL	161.8	156.0	154.8		158.2	157.1	
Final	149.4	120.9	103.4	<0.001	108.7	118.1	<0.001
Mean % change	-2.0	-20.7	-32.4		-30.8	-22.9	
SE	3.38	3.43	3.43		3.66	3.37	
Non-HDL-C	n=26	n=24	n=25		n=21	n=26	
BL	228.0	221.3	220.3		222.6	215.9	
Final	188.0	171.8	131.6	<0.001	145.3	145.3	0.60
Mean % change	-16.5	-21.6	-39.4		-34.8	-32.7	
SE	2.66	2.76	2.70		2.94	2.66	
Apo B	n=27	n=23	n=25		n=25	n=27	
BL	157.8	146.1	151.7		146.6	148.1	
Final	128.3	114.1	96.7	0.001	99.2	101.5	0.65
Mean % change	-17.1	-22.2	-35.4		-32.3	-30.7	
SE	2.59	2.77	2.66		2.66	2.56	

Apo=Apolipoprotein, BL=Baseline mean (mg/dL), FA=Fenofibric acid, Final=Final visit mean (mg/dL), S=Simvastatin, SE-Standard Error, TG=triglyceride. P-values are FA+S vs. S, except for LDL-C (FA+S vs. FA).
Conclusion: The combination of FA+S resulted in more comprehensive improvement of multiple lipid parameters than either monotherapy in patients with T2DM and mixed dyslipidemia.

Conflict of interest:
Stock ownership: Sleep DJ, Kelly MT, and Setze CM are Abbott stockholders.
Employee: Sleep DJ, Kelly MT, and Setze CM are employees of Abbott. Ansquer JC is an employee of Laboratories Fournier SA.
Commercially-sponsored research: Mohiuddin SM has received grant/research support from Abbott.

Complications - hypertension

D-0814

Prevalence, awareness, treatment and control of elevated blood pressure among U.S. adults with diagnosed diabetes, 2001-2006

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Aim: Hypertension control, treatment and awareness are important components of diabetes treatment and care. The objective of this study is to examine the prevalence, awareness, treatment and control of elevated blood pressure (BP) among older adults with diagnosed diabetes in the U.S.
Methods: We used data from the National Health and Nutrition Examination Survey (NHANES) for the years 2001 through 2006. Our sample included 1181 adults age 45 years and older with self-reported diagnosed diabetes. Elevated BP was defined as mean systolic BP (SBP) ≥ 130 or diastolic BP(DBP) ≥ 80 mmHg or current use of prescription medication. Among those with elevated BP, awareness was defined as self-reported, diagnosed hypertension; treatment was defined as current use of prescription medication, and control was defined as having mean SBP <130 and DBP < 80 (<130/80), SBP <130 and DBP< 85 (< 130/85), or SBP <140 and DBP < 90 mmHg (< 140/90).
Results: Among adults with diagnosed diabetes, 81% (95% Confidence Interval [CI] 78-84%) had elevated BP. Prevalence was higher among adults 65 years and older (89%; 95% CI 86-92%) compared to adults 45-64 years (74%; 95% CI 68-80%); women were more likely to have elevated BP compared to men (84%; 95% CI 81-88% vs. 77%; 95%; CI 72-82%); and non-Hispanic blacks and non-Hispanic whites were more likely to have elevated BP (88%;95% CI 82-93% vs. 82%;95% CI 78-86%) compared to Hispanics (67%;95% CI 58-76%). Among adults with diabetes and elevated BP, 84% (95% CI 81-88%) were aware of their condition and 78% (95% CI 74-82%) were under treatment. However, only 27% (95%CI 24-31%), 31% (95% CI 27-35%), and 57% (53-61%) had mean BP <130/80, <130/85, or <140/90 mmHg, respectively.
Conclusions: The prevalence of elevated BP is high among adults 45 years and older with diagnosed diabetes in the U.S. Although the majority of these adults are aware of their condition and under treatment, control remains poor with less than a third of adults with diabetes and hypertension having blood pressure < 130/80 mmHg.

No conflict of interest

D-0815

Isolated office hypertension (white coat effect) is independently associated with increased central aortic stiffness in type 2 diabetes

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Aims: Isolated uncontrolled office hypertension or white coat effect has been associated with structural cardiac abnormalities; however, its relation to a worse cardiovascular prognosis remains uncertain. The aim of this study was to investigate whether white coat effect (WCE) was independently associated with two subclinical markers of cardiovascular disease, increased aortic stiffness and left ventricular hypertrophy, in patients with type 2 diabetes.
Methods: 514 type 2 diabetic patients were evaluated in a cross-sectional study. Clinical, laboratory and 24-hour ambulatory blood pressure monitoring (ABPM) data were obtained. Controlled hypertension was defined by office blood pressure (OBP) < 140/90 mmHg and daytime BP < 135/85 mmHg on ABPM, whereas WCE by OBP ≥ 140/90 mmHg and daytime BP < 135/85 mmHg. Arterial stiffness was assessed by carotid–femoral (aortic) pulse wave velocity (PWV) measurement and left ventricular mass indexed to body surface area (LVMI) by echocardiography. Statistics included bivariate analysis and multivariate logistic regression to investigate if increased aortic PWV (>12m/s) and LVMI was independently associated with the WCE.
Results: According to blood pressure patterns, 28.7% had controlled hypertension, 32.9% WCE, 8.3% masked hypertension (or isolated uncontrolled ambulatory hypertension) and 30.2% uncontrolled hypertension both in the office and in ABPM. Patients with WCE were older, had greater prevalence of

diabetic retinopathy, used more antihypertensive drugs, had higher serum LDL-cholesterol levels and greater LVMI and aortic PWV than those with controlled hypertension. On multiple logistic regression, an increased aortic PWV was independently associated with WCE (OR=2.96; 95%CI: 1.43-6.13 p=0.004), after adjusting for other possible confounding variables, whereas LVMI was not associated with WCE. Other variables associated with WCE were the number of antihypertensive drugs in use, 24-hour systolic blood pressure, LDL-cholesterol and smoking status.

Conclusions: In type 2 diabetic patients, isolated office hypertension (white-coat effect) is associated with increased aortic stiffness; this may be a link to augmented cardiovascular risk independent of other established determinants of vascular damage.

No conflict of interest

D-0816

A blunted nocturnal blood pressure reduction is associated with several unfavorable cardiovascular risk markers in type 2 diabetes

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Aims: A blunted nocturnal blood pressure reduction or an abnormal circadian BP variability (non-dipping) pattern had been reported as a worse cardiovascular prognostic marker in several clinical conditions. However, their importance in diabetic patients is controversial. The aim of this study was to evaluate the independent correlates of a blunted nocturnal BP fall or the non-dipping pattern in type 2 diabetic patients.

Methods: 514 type 2 diabetic patients were examined in a cross-sectional design at entry into a cohort study. Clinical, laboratory, echocardiographic and 24-hour ambulatory BP monitoring data were obtained. Aortic stiffness was assessed by carotid-femoral pulse wave velocity measurement. Non-dipping was defined as a nocturnal BP reduction <10% of daytime BP. Statistical analyses included multiple linear regression (with continuous nocturnal BP fall as the dependent variable) and logistic regression (with dipping/non-dipping status as the dependent variable).

Results: 303 patients (58.9%) were non-dippers. Non-dippers were older, had longer diabetes duration, higher post-prandial glycemia and higher mean HbA_{1c} during the first year of follow-up than normal dipping patients. They had a higher prevalence of hypertension, used more anti-hypertensive drugs, particularly ß-blockers and diuretics, and had higher office systolic BP than normal dippers, but had equal ambulatory daytime BP levels. Non-dippers had also a greater prevalence of dyslipidemia, physical inactivity, left ventricular hypertrophy (LVH), increased aortic stiffness, and of all macro and microvascular degenerative complications. On multivariate logistic regression, the presence of LVH (OR: 1.82, 95%CI: 1.24-2.66) and of dyslipidemia (OR: 1.86, 95%CI: 1.06-3.27), the use of ß-blockers (OR: 1.65, 95%CI: 1.30-2.41), a low ankle-brachial index (<0.9, OR: 1.66, 95%CI: 1.05-2.61) and either a post-prandial glycemia >10.0 mmol/l (OR: 1.81, 95%CI: 1.15-2.86) or a mean HbA_{1c} >7.5% (OR:1.54, 95%CI: 1.05-2.25) were the independent correlates of the non-dipping pattern. On multiple linear regression, a blunted nocturnal BP fall was independently associated with an increased aortic stiffness, increased left ventricular mass, higher HbA_{1c} levels, higher serum total cholesterol, presence of peripheral neuropathy and use of ß-blockers.

Conclusions: A blunted nocturnal BP fall and the non-dipping pattern are independently associated with several untoward prognostic markers in type 2 diabetic patients. These relationships may explain the worse cardiovascular outcome associated with abnormal circadian BP variability patterns.

No conflict of interest

D-0817

One-year follow-up of biologic correlates for arterial blood pressure in type 2 diabetes

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Aims: Previous results suggested that blood pressure (BP) response to exercise was significantly correlated with HbA1c levels in healthy normotensive non-diabetic control subjects. Present investigation evaluated the biologic determinants of arterial BP during one-year follow-up in patients with type 2 diabetes (T2D).

Methods: Cardiovascular risk factors were assessed at baseline, 1, 3, 6, 9 and 12 months in 20 T2D (age 60±5 y). Were measured: body mass index (BMI), waist to hip ratio (WHR), mean BP, fasting plasma glucose (FPG), HbA1c, plasma LDL cholesterol, folate and total homocysteine (tHcy), urinary albumin excretion (UAE). Dietary habits were estimated at each visit by administering a 2-d 24-h dietary recall (24HDR).

Results: BMI was 31±5 kg/m2, WHR 0.97±0.06, mean BP 98±10 mm Hg, FPG 159±42 mg/dl, HbA1c 7.4±1.2%, LDL 118±31 mg/dl, folate 8.9±6.6 ng/ml, tHcy 11.5±3.4 µmol/l. UAE ranged from 0 to 2957 µg/min (median 15.8). Multivariate regression analysis of longitudinal data found the following independent variables to be associated with MBP ($|r| = 0.54$, $P<0.0001$): HbA1c (t-value 5.24), folate (-2.84), and LDL (2.21). Estimated daily intake of folic acid was 286±129 µg/day significantly lower than Recommended Dietary Allowance.

Conclusion: Present study confirms in T2D previous observations in healthy people. There is a significant positive correlation between protein glycosylation and arterial BP. Additional influential factors are plasma folate and LDL cholesterol. These findings strengthen the need for maintaining a strict metabolic control (glycosylation of matrix proteins affects artery compliance) and promoting an adequate dietary intake of folate.

No conflict of interest

D-0818

Pulse pressure and pulse wave velocity as markers of arterial stiffness in patients with type 1 diabetes

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Aims: Type 1 diabetes is associated with an acceleration of arterial stiffness with age and an increased cardiovascular risk as compared to nondiabetic controls. The aim of the study was to compare two markers of arterial stiffness, arterial Pulse Pressure (PP) and Pulse Wave Velocity (PWV), in type 1 diabetes patients and in age-matched controls.

Methods: 59 (20-55 years) type 1 diabetic patients (24 women/35 men, 41±9 years, 20±9 years of diabetes, HbA1c 8.5±1.6 %) and 31 age-matched control subjects were evaluated with a continuous noninvasive arterial blood pressure monitoring (Finapres®). Recordings were performed in standing position (1 min), in squatting position (1 min), and again in standing position (1 min), but most presented data correspond to average PP (systolic - diastolic pressure) values calculated during the overall period. PWV was measured in supine position between the carotid and femoral peripheral artery sites with a SphygmoCor Vx®. Twenty-two diabetic patients were treated with a renin-angiotensin inhibitor, mainly because of microalbuminuria.

Results: PP was significantly higher in diabetic than in nondiabetic subjects (58±14 vs 50±10 mm Hg; p<0.002). The relative PP increase from standing to squatting tended to be higher in diabetic than in nondiabetic individuals (+6±9 vs +4±4 mmHg; p= 0.185). This posture difference was amplified in diabetic individuals above 40 years (+8±9 vs +4±10 mmHg; p= 0.141). PWV was also significantly increased in the diabetic group when compared with the control group (5.2±1.5 vs 4.4±1.5 m/sec; p=0.026). No differences were detected according to gender (5.2±1.6 m/sec in diabetic women vs 5.2±1.4 m/sec in diabetic men, NS; 4.6±1.6 m/sec in nondiabetic women vs 4.1±1.4 m/sec in nondiabetic men, NS). No significant differences in PP and PWV were observed in patients receiving (62 ± 19 mm Hg; 5.5±1.6 m/sec) or not receiving (55 ± 10 mm Hg; 4.9±1.3 m/sec) a renin-angiotensin blocker (p=0.11 and p=0.12, respectively). In the diabetic population, positive correlations were observed between PWV and PP (r=0.3127; p=0.0179), PWV and age (r=0.3460; p=0.0073), PWV and diabetes duration (r=0.3009; p=0.0206), PP and age (r=0.4339; p<0.0001), and PP and diabetes duration (r=0.1761; p=0.2240). In contrast, no such correlations were observed in the nondiabetic controls, neither between PWV and PP (r=-0.09; NS) nor between each of these two indices and age (r=-0.2129, NS, for PWV and r= -0.08, NS, for PP).

Conclusion: Type 1 diabetes was associated with an increase in both PP and PWV as compared to a nondiabetic population. In the diabetic population, a close correlation between the two indirect markers of arterial stiffness was found and also between each of them and age (or diabetes duration), but not in controls. These observations support the concept of an earlier arterial stiffness in type 1 diabetes with rather poor glycemic control.

No conflict of interest

D-0819

Pioglitazone reduces urinary albumin excretion in RAS inhibitor-treated type 2 diabetic patients with hypertension and microalbuminuria: a prospective, randomized study

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Aims: In type 2 diabetes, microalbuminuria is an important risk factor not only for the progression of nephropathy but for cardiovascular events. Thus, the reduction of urinary albumin excretion is important. In the present study, we compared the effect of pioglitazone with metformin on urinary albumin/creatinine ratio and metabolic parameters for 52 weeks in type 2 diabetic patients with microalbuminuria and hypertension who were treated with RAS-inhibitor (ARB or ACE-I).
Methods: We conducted an open-label, randomized trial in patients with type 2 diabetes and hypertension. After treatment with RAS inhibitor at least 12 weeks, 70 patients with microalbuminuria (urinary albumin/creatinine ratio > or = 30mg/gCr to < 300 mg/gCr) received either pioglitazone (15 or 30mg/day;. n = 37) or metformin (500 or 750mg/day; n=33) for 52 weeks. Treatment dose of RAS inhibitor was not changed during the study. Urinary albumin/creatinine ratio, HbA1c, FPG, blood pressure, lipids, body weight were measured every 12 weeks.
Results: The mean urinary albumin/creatinine ratio decreased significantly (-16.6% ; 148.0 mg/gCr at 0W and 123.4 mg/gCr at 52W) in the pioglitazone group compared to an increase of 53.7% (114.5 mg/gCr at 0W and 175.9 mg/gCr at 52W) in the metformin group ($p < 0.05$ between groups). The mean HbA1c decreased 0.8% in the pioglitazone group and 0.3% in the metformin group. The mean systolic blood pressure decreased 3.3mmHg in the pioglitazone group and increased 5.6mmHg in the metformin group. The differences of HbA1c and systolic blood pressure between the groups was not significant. There were no significant differences in FPG, LDL-cholesterol, HDL-cholesterol and triglyceride between groups.
Conclusion: This study indicates therapeutic benefit of pioglitazone add-on to RAS inhibitor as compared with metformin, in terms of reduction of urinary albumin excretion, for type 2 diabetic patients with hypertension.

No conflict of interest

D-0820

Prevalence of hypertension and microalbuminuria in type 2 diabetic patients

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Aims: Microalbuminuria is believed to be a marker of cardiovascular disease not only in subjects with diabetes mellitus (DM) but also in the general population. Metabolic syndrome (MS) has been associated with a high incidence of cardiovascular events. In a cross-sectional study we aimed to evaluate the prevalence of MS and its relationship with microalbuminuria and cardiovascular events in a cohort of patients with type 2 DM.
Methods: This cohort consists of 459 type 2 diabetics with MS (52% M, 48% F; mean age 64±10 yrs, diabetes duration 10.5±8.1 yrs, BMI 32.2±3.8 kg/m^2, HbA1c 8.2±1.7%). The MS was defined according to ATPIII criteria. The incidence of fatal and non-fatal cardiovascular events (myocardial infarction, ischemic stroke) was recorded. These data were compared to 122 type 2 diabetic patients without MS (54% M, 46% F; mean age 62±10 yrs, diabetes duration 9.6±7.2 yrs, BMI 26.9±3.4 kg/m^2, HbA1c 8.1±1.7%).
Results and discussion: Among diabetic males the prevalence of microalbuminuria was higher in subjects with MS (23.2%) than in those with no MS (10.9%, p<0.005). In females the same features were: with MS 15.9%, with no MS 6.2% (p<0.001). Prevalence of microalbuminuria increased with the number of components of MS both in males and in females. Estimated glomerular filtration rate was lower in diabetic patients (males and females) with MS than in those with no MS. Multiple regression analysis indicated the number of MS components, age and HbA1c to be independent predictors of microalbuminuria. Type 2 diabetic patients with MS had more incidence of ischemic stroke (7.1% vs 0.7%; p<0.05), more myocardial infarction (6.9% vs 0.6%; p<0.05) as compared to the diabetic patients without MS.
Conclusion: The prevalence of microalbuminuria is higher in type 2 diabetic patients with MS. Microalbuminuria showed graded relationship with the number of MS components. The aggregation of MS involved more cardiovascular risk in patients with type 2 DM.

No conflict of interest

D-0821

Evaluation of candesartan compared to olmesartan on insulin-sensitivity related parameters in type 2 diabetic hypertensive patients

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Aims: The correlation among retinol-binding protein-4 (RBP-4), visfatin, vaspin and markers on insulin sensitivity and glucose metabolism is unclear. Few studies considered the actions of sartans on these parameters. Our study aimed to compare the effect of Candesartan (C) vs Olmesartan (O) on insulin-sensitivity-related parameters, before and after antihypertensive therapy.
Methods: After 4 week washout placebo period, 105 hypertensive (DBP ≥ 80 mmHg and SBP ≥ 130 mmHg) patients with well controlled type 2 diabetes (HbA1c < 7%) were randomised to C 8 mg o.d. or O 10 mg o.d. and titrated after 1 month to C 16 mg o.d. or O 20 mg o.d.; the treatment period had a 1 year duration. We evaluated SBP, DBP, and collected plasma samples of (RBP-4), visfatin, and vaspin at baseline, and after 1 year.
Results: Ninety-eight patients completed the study (52 in C and 47 in O group). SBP and DBP were significantly reduced by both treatments [from 144±8 / 88±6 mmHg to 126±5 / 77±4 by C (p< 0.001) and from 145±9 / 89±7 mmHg to 128±7 / 79±5 mmHg by O (p< 0.001)] without any difference between them. The RBP-4 was reduced by 21.3±7.8 mg/ml in C group (p< 0.01), and by 4.4±1.5 mg/ml in O group (ns vs baseline, p< 0.05 vs C). Visfatin increase was 7.8±4.7 ng/ml in C group (p< 0.05), and 3.1±1.8 ng/ml in O group (ns vs baseline, p< 0.05 vs C), and vaspin reduction was 0.3±0.1 ng/ml in C group (p< 0.05), while was unchanged in O group (ns).
Conclusion: Candesartan therapy compared to O therapy improved insulin-sensitivity, beyond the same reduction in blood pressure.

No conflict of interest

Complications - neuropathy 1

D-0822

Which grading tool for diabetic polyneuropathy is most useful clinically ?

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Aims: Loss of vibration sensation is an early sign in sensory diabetic polynueropathy (DPN). We devised a practical grading scale (Sakkal's scale), easy to do in the first office visit and every follow-up visit within 2 minutes. This study is to compare its application to the Oyer's grading system in clinical practice.
Methods: We tested 52 consecutive patients with two grading systems (Sakkal's and Oyer's). The Sakkal's grading with the 128 Hz tuning fork records the loss of vibration sensation, at the first office visit and every follow-up visit,at 10 levels from the hip downward: 1-toes and foot bottom 2-mid foot 3-ankle 4-lower third of the shin 5-mid shin 6-upper third of shin 7-knee 8-thigh 9- hip 10-above the hip. The Oyer's grading records the vibration time in seconds at the big toe. Each patient had intermediate outcome measures (FBS, PPG, HbA1C, etc...) tested before and after therapy (metabolic control, Trazadone, and adjuvant analgesic).
Results:
At baseline
Sakkal's Scale: loss of sensory vibration was found in 30 patients (57.7%) at the following levels: Below the ankle 16/30(53%),above the ankle14/30(47%)
Oyer's test showed decreased vibration in 31 patients (59%): 8 by 5 seconds, 23 by 10 seconds or more. Average FBS was 248, average HbA1C was 9.2%.

After therapy

Sakkal's Scale: loss of sensory vibration clearly improved within 2-4 weeks and up to 4 months in 91% of patients, normal or Below the ankle in 20/30 patients (67%), above the ankle 7/30 (33%). 6 patients(20%) became completely normal, and none were above the knee.

Oyer's test showed Improved vibration in 86% of patients by 2 seconds Average. FBS became 133, HbA1c 7.2%.

Comparing baseline with after therapy **for the total group:** FBS decreased by 115, HbA1c decreased by 2%. In Sakkal's Scale improvement in sensory vibration by any level was seen in 27 of the total 30 original patients with neuropathy or 90% with near complete improvement above the knee and nearly 70% reaching below the ankle level. In Oyer's test it improved in 86% by 2 seconds in nearly each group reaching below 5 seconds level in 52% of patients.

Discussion: Documenting the level of the loss of sensory vibration in diabetic neuropathy is an objective, accurate, easy to implement, time saving, reproducible clinical grading tool (Sakkal Scale) which correlates well with patient symptoms and metabolic control. It improves communication in research and clinical care in most patients. Improvement seen was a very important objective sign to patient and physician alike. Patients were able to see easily each level of improvement correlated with metabolic control, making patients more committed to treatment plan.

Conclusion: The improvement in diabetic polyneuropathy was strikingly seen in more than 70% of patients with Sakkal's Scale below the ankle (52% with the Oyer's test below 5 seconds) pointing to a significant reversible component probably related to glycaemic/metabolic control.

No conflict of interest

D-0823

Prediction of 4-year diabetic neuropathy risk using a semi-quantitative monofilament score.

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We previously defined the cross-sectional characteristics of a semi-quantitative 10g monofilament score in assessing the presence or absence of diabetic sensorimotor polyneuropathy (DSP) in 478 diabetes subjects from the Toronto Diabetic Neuropathy Cohort. A score of 7 or more correct responses out of 8 ruled out - while a score of only 3 correct responses or fewer ruled in - the presence of DSP with sufficient sensitivity and specificity. We hypothesized that a score between 3 and 7 could represent incipient nerve injury (akin to microalbuminuria as an indicator of incipient kidney injury) and could predict with sufficient sensitivity subsequent risk of clinical DSP onset. Of the 249 diabetes subjects without DSP in the Cohort (according to the criteria of England et al., 2005), we re-examined 175 (70%) a mean of 4.1 years later. The study group was 33% female, 16% type 1 diabetes, had mean age 56±9y, and diabetes duration 12±10y. Baseline monofilament scores ≤3 were uncommon (only 35 subjects): These subjects had the highest 4y risk of DSP (57%). In contrast, those with scores ≥7 had the lowest 4y DSP risk (13%). Those with intermediate scores (>3 but <7) had 28% 4y DSP risk. Receiver-operating characteristic (ROC) curve analysis determined the optimal threshold for the 4y DSP risk to be 5/8. The positive and negative screening test results (corresponding to scores of ≤5 and >5, respectively) had 74% sensitivity, 64% specificity, and positive and negative likelihood ratios of 2.1 and 0.4 (Chi^2 20.7, $p<0.0001$). The area under the ROC curve was 0.675. This study defines the clinical utility of a semi-quantitative monofilament score for DSP screening. A simple threshold of 5 discriminates those individuals at the lowest and the highest 4y risk of DSP. Of greatest importance, the sensitivity of a negative test result has major implications for a simple DSP screening program generalizable to the clinical setting – A negative screening test result has acceptable sensitivity for ruling out the intermediate-term DSP risk, akin to the low nephropathy risk observed for an individual with normoalbuminuria.

No conflict of interest

D-0824

CPT(Current Perception Threshold) is useful to estimate the progression of peripheral diabetic neuropathy

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Aims: Diabetic peripheral neuropathy is the most common microangiopathy in patients with diabetes. But, it is easily underestimated because the early phase neuropathy is clinically latent and hard for absolute grading. In order to estimate the early phase peripheral neuropathy, it is important to use the absolute estimation strategy. In this study, we estimated CPT(Current Perception Threshold) values of patients with type 2 diabetes using neurometer.

Methods: We conducted the new diagnostic criteria of neuropathy for 62 patients with type 2 diabetes. Based on the progression of neuropathy, the diagnostic criteria (I–V) of diabetic peripheral neuropathy was developed by the Japan working group. This criteria is summarized as followings: stagel(presymptomatic), II(sensory symptom),III(sensory disturbance/lack of ATR), IV(severe sensory disturbance/autonomic dysfunction), V(motor system impairment). We simultaneously estimated CPT values stimulated by three distinct electrical stimuli (5, 250, 2000Hz) using neurometer. Then, we analyzed the relationship between the CPT value and HbA1c, nerve conduction velocity, which may contribute to diagnose the progression of peripheral neuropathy.

Results: According to the criteria, 62 patients were divided into the following five groups: stage I(29), II(15), III(11), IV(4), V(3). The progression of neuropathy was correlated with the duration of diabetes and the frequency of diabetic retinopathy. Most patients showed abnormal CPT value in stage III which include sensory disturbance as well as the impairment of Achilles' tendon reflex. The average CPT value increased in accordance with the progression of stage criteria. Moreover, even in presymptomatic stage I, the prevalence of CPT abnormality was 5Hz(5 / 29:17.2%), 250Hz(5 / 29:17.2%), 2000Hz(8 / 29:27.6%). CPT of 2000Hz was inversely correlated with SCV, and CPT of 5Hz and 250Hz was inversely correlated with SCV, MCV and CVRR. The significant correlation of CPT value was observed between 5Hz, 250Hz and 2000Hz stimuli. There was no positive correlation between CPT and HbA1c.

Discussion: CPT value is significantly associated with the progression of peripheral neuropathy. There was no relevant discrepancy between CPT values of three distinct stimuli. The progression of neuropathy appears to result in the dual impairment of CPT values (5, 250, 2000Hz). The negative correlation between CPT and SCV indicates CPT reflects the electrical disturbance of peripheral nervous system. It is noteworthy that 17-28% of patients in presymtomatic stage already showed the impairment of CPT. In conclusion, CPT value could contribute to detect the early phase diabetic neuropathy and estimate the quantitative progression of peripheral neuropathy.

Stage of Neuropathy	(1)	(2)	(3)	(4)	(5)
Duration of DM(year)	6.0±5.8	8.4±5.8	16.0±11.4	14.5±3.8	15.7±6.6
CPT(2000Hz)	293.8±86.4	323.8±91.8	430.3±103.0	524±117.1	999

No conflict of interest

D-0825

Efficacy of epalrestat in patients with diabetic neuropathy and its influence on blood taurine levels

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Aims: Many diabetic patients complain of various symptoms of diabetic neuropathy such as localized painful muscle cramps. It has been reported that cramp is caused by various factors, such as abnormal peripheral nerve excitation, dehydration, electrolyte abnormalities, and abnormalities of lactic acid and taurine metabolism. The influence of a decrease of taurine in the plasma and nerve cells is considered particularly important under hyperglycemic conditions. Accumulation of sorbitol due to an abnormal increase of polyol metabolism under hyperglycemic conditions is considered to be one of the causes. Epalrestat is an aldose reductase inhibitor that is currently the only drug used clinically to correct abnormal activation of the polyol pathway. It was

recently reported that epalrestat suppressed the uptake of taurine into nerve cells and prevented an increase of nerve cell osmolality in an animal model. The drug is thus expected to show the effect for ameliorating neuropathy symptom via suppression of decrease in taurine. Changes of the symptoms associated with peripheral neuropathy and changes of the serum taurine concentration were investigated in this study during administration of epalrestat to patients with diabetic neuropathy.

Methods: Epalrestat was administered to 46 patients with diabetic neuropathy. Before and after 3 months of administration, the serum taurine concentration was measured, a monofilament touch test and a vibration test (C64 tuning fork) were performed, and symptoms were investigated (cramp, numbness, and dysesthesia of the sole). Each of the symptoms was classified using 3 grades: absent, tolerable, and intolerable.

Results: Compared with baseline, the serum taurine concentration improved to the normal reference range (43.9 - 57.1 nmol/ml) after 3 months of administration, and the symptom of cramp was significantly improved. Improvement was also observed in the monofilament touch test. There was no significant change of the HbA_{1C} level after 3 months of epalrestat administration compared with baseline.

Conclusion: Treatment with epalrestat for 3 months in patients with diabetic neuropathy was suggested to improve symptoms and correct neurological dysfunction. The serum taurine concentration may be used as an objective index of the efficacy of epalrestat treatment.

No conflict of interest

D-0826

Modern questions of diagnostics and treatment of diabetic polyneuropathy

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Aim: to study alpha-lipoic acid influence on diabetic polyneuropathy (DPN) course.

Method: In 2006-2007 100 patients of the main and comparison groups were treated (neuroischemic form of diabetic foot (DF) – 70 patients, neuropathic form -30 patients). Main group patients were administered alpha-lipoic acid preparations ("Tioctacid", "ASTA Medika", Pliva; "Berliotion", "Berlin-Chemie") –daily 600 mg, dissolved in 200 ml of 0.9 % NaCl solution within 3 weeks, then perorally 600 mg once a day within 14 weeks. Control group patients were administered 200 ml of 0.9 % NaCl solution and 1 % riboflavin solution intravenously, using a dropper, within 3 weeks, then patients were taking polyvitamins for 5 weeks. Neurological investigation results were evaluated in 10, 30 days and in 3 months. Subjective manifestations were evaluated by means of TSS-complaint scale, DPN objective symptoms were evaluated by means of NIS-scale and NIS_{LL} modified scale. Instrumental investigation of peripheral innervation was done by computer stimulating electromyography (EMG), using OI-MBN-electroneuromyograph.

Results: In the main group an average score of TSS and NIS_{LL} scales as a result of treatment was reliably decreased by 30 day and continued decreasing by 90 day. Essential positive dynamics of EMG values was found out (residual latency (RL), M-response, ESS_M (excitement spreading speed). Statistically meaningful effect arose within the interval 10-30 days of treatment and gradually increased by 90 day. In comparison group reliably significant difference was not obtained in RL, M-response amplitude and ESS_M. All values had $p > 0.05$.

Conclusion: Efficiency of use of alpha-lipoic acid preparation (daily 600 mg, dissolved in 200 ml of 0.9 % NaCl solution within 3 weeks, then perorally 600 mg once a day within 14 weeks) in patients with DPN as compared to preparations of water-soluble B-group vitamins was proved.

No conflict of interest

D-0827

Nerve conduction study among patients with type 2 diabetes – predictive factor of neuropathy?

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Background: Diabetic sensorimotor polyneuropathy (DSP) is one of the most frequent and costly complications of type 2 diabetes. It may be asymptomatic, but, once established it is irreversible and may finally be disabling. Nerve damage is considered to be related to poor metabolic control and duration of diabetes. Nerve conduction study (NCS) is a sensitive method for the early detection of peripheral neuropathy.

The aim of the study: to estimate the prevalence of neuropathy in type 2 diabetic patients, to identify which risk factors are related to the severity of DSP and to demonstrate the importance of neurophysiologic examination in patients with diabetic neuropathy.

Material and method: We present the results of nerve conduction studies (NCS) performed in 86 type 2 diabetic patients - 40 F, 46 M - mean age 56±10 years and the mean duration of diabetes 7.2 years. Clinical evaluation was performed according to the "Toronto Clinical Scoring System for DSP". Needle electromyography (EMG) studies were performed. The parameters that were measured: ulnar motor and peroneal motor, sural sensory nerves *conduction velocity*, sural sensory nerve *action potential amplitude* and *F-wave latency* of the ulnar and peroneal nerves. BMI, HbA1c and lipid profile were used for the assessment of metabolic control. Diabetes treatment, existence of chronic complications, the presence of hypertension and smoking were recorded.

Results: Clinical neurologic examination was abnormal in 61 patients (71%). Isolated sensory symptoms and signs were more common (40%) than motor ones (19%). NCS revealed sensorimotor polyneuropathy in 63.3% pts. The mean HbA1c value was 9.5% in patients with abnormal NCS vs. 8.7% in patients with normal parameters (P=0.06). Prolonged F-wave latency - after exclusion of other causes of radiculopathy – was noted in 67% patients with abnormal NCS, only 28% of them having motor symptoms. Impaired nerve conduction velocity has been found more frequently in smokers, in patients with other chronic complications (rethinopathy, nephropathy) and in the presence of hypertension. A negative correlation existed between serum HDL-cholesterol level and Prolonged F-wave latency. Motor and sensory nerve action potential amplitude were more affected in males ($P<0.05$).

Conclusions: The most common form of neuropathy that has been found is sensorimotor polyneuropathy. Poor glycemic control (Hb A1c ≥ 9 %) is an important factor related to the severity of neurological impairment. The risk factors for atherosclerosis, such as hypertension, smoking, and decreased HDL cholesterol levels, might also be risk factors for DSP. Most patients with diabetic polyneuropathy could be apparent asymptomatic, making detection extremely dependent on careful neurological examination.

No conflict of interest

D-0828

Treatment of diabetic peripheral neuropathy in patients with type 2 diabetes mellitus

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Background: Diabetic Neuropathy (DN) leads to raised incidence of morbidity and mortality in Diabetic Patients. Increasing interest deserves positive results obtained with alpha-lipoic acid in terms of DN pathogenic treatment approach. The aim of our study was to evaluate the action of alpha-lipoic acid ("Thiogamma" Wörwag Pharma, Germany) in patients with Type 2 Diabetes with Distal Symmetric Polyneuropathy (DSP).

Materials and methods: 61 patients (pts) with type 2 Diabetes at the age of 40-65 years and HbA1c<8% were evaluated in two matched groups by age, sex, diabetes duration and the grade of DN; 31 pts in study group and 30 pts in the control group. Thiogamma according to following scheme: 50 ml intravenously for first 3 weeks, after that orally - 600 mg/daily for 4 weeks was additionally administered to the patients of the study group. Patients were evaluated before, after 3 and 7 weeks of treatment. The efficiency of Thiogamma was evaluated according to: Dynamics of changes of Neuropathy Symptoms Score (NSS) and Neuropathy Deficit Scores (NDS), including the evaluation of neuropathy signs and reflexes.

Results: After 3 weeks of therapy permanent and high-intensity nocturnal pain, as well as other types of paresthesia were decreased significantly in the study group compared to the control group. After the intravenous course of therapy in the study group NSS significantly decreased (8,4± 2,7 vs 4,12±2,35 (p<0.0001)); as well as NDS (4,9 ± 2,3 vs 2,8 ±0,7 (p=0.001)). Following oral administration of Thiogamma not only maintains the reached effect, but also ensures the positive dynamics of NSS scores (p<0.0001). During the therapy, the HbA1c level was statistically significantly reduced in the study group (from 7.69±0.73% to 6.73±0.8%) compared to control group (from 7.39±0.75% to 6.59±0.85%), indicating the positive effect of Thiogamma treatment on carbohydrate metabolism. There was no statistically significant reduction of NSS and NDS in the control group.
Conclusion: This study suggests that alpha-lipoic acid effectively reduces signs and symptoms of DN and improves metabolic control in patients with Type 2 Diabetes.

No conflict of interest

D-0829

Diabetic neuropathy and depression in patients with type 2 diabetes

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Background and aims: Peripheral neuropathy (DPN) affects 30% of people with diabetes, and positively correlates with DM duration, its severity and increased mortality. Current studies suggest that diabetes is often associated with depression. At the moment of diagnosis type 2 diabetes (T2DM) is already present for 5-7 years, and several long-term diabetes complications, including peripheral neuropathy, can be observed. The latter makes development of depression more likely and its degree more severe, thus worsening the quality of life of people with DM. This in turn accelerates progression of DM complications. The aim of the present work was to study the rates of diabetic neuropathy and depression and their relationship in T2DM patients.
Design and methods: There were 59 patients with type 2 diabetes (33 males / 26 females, mean age - 46 ± 5.72 yrs, mean HbA1c - 8.2±2.1%) without overt macrovascular complications and/or nerve damage of non-diabetic origin. Diabetes duration was ≥ 6 months. Peripheral nerve function was assessed by NEUROMETER® R-CPT neuroselective sensory nerve evaluation method. The electric current perception threshold was measured for three frequencies: 5Hz, 250Hz, and 2000Hz, using automated double-blind methodology (+/- 20 μAmperes) at two sites – the distal phalanx of the hallux in both feet (the lateral and medial aspects of the toes). Abnormal and normoesthetic R-CPT measures from T2DM patients were compared to depression incidence. For depression assessment Hamilton's and Beck's scales were used.
Results: The tests revealed that 19 out of 59 patients (32.2%) had depression of various severities. The prevalence of sensory dysfunction accounts for (35.59%) 21 patients. Difference in depression rates was observed between the patients with peripheral nerve damage and the patients without peripheral nerve damage. Nine out of 21 patients (42.85%) with peripheral nerve damage, and 10 out of 38 normoesthetic patients (26.31 %), had depression of various degree.
Conclusion: The highest percentage of depression was observed in the group of patients with peripheral nerve damage, and the lowest in the group of patients without peripheral nerve damage. Results have shown slight positive correlation between peripheral nerve damage and depression rates. Further studies are recommended.

No conflict of interest

D-0830

Sensitivity analyses of the primary efficacy endpoint in a randomized-withdrawal phase 3 trial of tapentadol extended release (ER) in patients with painful diabetic peripheral neuropathy (DPN)

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Aims: Tapentadol is a novel, centrally acting analgesic with 2 modes of action, μ-opioid receptor agonism and noradrenaline reuptake inhibition. Sensitivity analyses assessed the robustness of observed treatment effects on the primary efficacy endpoint of a randomized-withdrawal, placebo-controlled study of tapentadol ER in patients with painful DPN.
Methods: Patients were titrated to an optimal dose of tapentadol ER (100-250mg bid) during a 3-week open-label (OL) phase. Patients with >=1 point improvement in pain intensity (0-10 NRS) were randomized 1:1 to receive tapentadol ER or placebo for a 12-week double-blind (DB) phase. Efficacy was assessed as change in mean pain intensity from start to end of the DB phase. Intermittent missing data were imputed using linear interpolation. The primary imputation method for missing data after discontinuation was last observation carried forward (LOCF). Sensitivity analyses were performed on the primary efficacy endpoint using the following imputation methods: baseline (start of DB) observation carried forward (BOCF), worst observation carried forward (WOCF), placebo mean imputation (PMI), modified BOCF (combination of BOCF and LOCF: if Patient Global Impression of Change was "much improved" or "very much improved" at discontinuation, LOCF was applied to pain intensity; otherwise BOCF was used), and no linear interpolation or carrying forward methods of imputation for observed cases (OC) for patients who completed treatment. Primary efficacy and sensitivity results were evaluated using analysis of covariance.
Results: Of 588 patients in the OL safety population, 395 were randomized to DB treatment and 389 were analyzed for safety and efficacy in the DB phase. For the primary efficacy evaluation, patients receiving tapentadol ER in the DB phase maintained the improvement in pain intensity scores observed during the OL phase, but patients in the placebo group significantly worsened (least squares mean difference [LSMD] between treatment groups, -1.3; $P<0.001$). Differences in mean pain intensity scores from baseline to Week 12 of the DB phase were significant (all $P<0.001$) for tapentadol ER versus placebo for all other imputation methods used, including BOCF (LSMD vs placebo, -0.6), WOCF (-1.1), PMI (-0.6), modified BOCF (-0.8), and OC for patients who completed treatment (-1.0). The most frequently reported treatment-emergent adverse events were nausea, dizziness, and somnolence in the OL phase, and nausea, anxiety, and diarrhea in the tapentadol ER group in the DB phase.
Conclusion: Significant improvement in the primary endpoint was demonstrated with all imputation methods used, indicating that the efficacy of tapentadol ER was robust in this study of patients with moderate to severe chronic pain related to DPN.

Conflict of interest:
Employee: ME, DYS, AO, and JH are employees of Johnson & Johnson. AS is an employee of Grünenthal GmbH.

D-0831

Health status (EuroQol-5 Dimension [EQ-5D]) in patients with painful diabetic peripheral neuropathy (DPN) treated with tapentadol extended release (ER): results of a randomized-withdrawal phase 3 study

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Aims: Health status was assessed using the EQ-5D questionnaire in a randomized-withdrawal study of tapentadol ER in patients with painful DPN.
Methods: Patients were titrated to an optimal dose of tapentadol ER (100-250mg bid) during a 3-week open-label (OL) phase. Patients with >=1 point improvement in pain intensity (0-10 NRS) were then randomized 1:1 to receive tapentadol ER or placebo for a 12-week double-blind (DB) phase; patients receiving tapentadol ER took the individually determined optimal fixed dose from the OL phase. Efficacy was assessed as change in mean pain intensity from start to Week 12 of DB maintenance using last observation carried forward to impute missing pain scores after discontinuation. EQ-5D was completed at pre-specified time points; it measures health outcomes in 5 dimensions (mobility, self-care, usual activities, discomfort/pain, anxiety/depression); results were evaluated using analysis of covariance.
Results: Of 588 patients who received >=1 dose of tapentadol ER during the OL phase, 389 received >=1 dose of study drug and were analyzed for safety and efficacy in the DB phase. Patients receiving tapentadol ER in the DB phase maintained the improvement in pain scores observed during the OL phase, but patients in the placebo group worsened (least squares mean difference ± standard error vs placebo, -1.3±0.20; $P<0.001$). For EQ-5D, from start of OL to start of DB, the percentage of patients in the DB intent-to-treat population who reported "no problems" increased and mean scores decreased for mobility (changed from 14.7% at baseline to 34.7% at start

of DB; mean change, -0.2), usual activities (30.1% to 49.6%; -0.2), pain/discomfort (0.0% to 10.0%; -0.5), and anxiety/depression (52.7% to 62.0%; -0.1). Differences in mean changes from start to end of DB were significantly in favor of tapentadol ER (lower score=improved health) for mobility (mean [SD] change: tapentadol ER, -0.0[0.45]; placebo, 0.1[0.47]; *P*=0.006), usual activities (-0.0[0.49] vs 0.1[0.48]; *P*=0.003), and pain/discomfort (-0.0[0.46] vs 0.2[0.52]; *P*=0.001) dimensions, and were similar in both groups for self care (0.0[0.38] vs 0.1[0.37]; *P*=0.905) and anxiety/depression (0.1[0.50] vs 0.0[0.50] *P*=0.341). Mean (SD) change from start to end of DB on EQ-5D health status index (higher score=improved health) was significantly different between treatment groups, favoring tapentadol ER (-0.0[0.21]) over placebo (-0.1[0.26]; *P*<0.001). Treatment-emergent adverse events reported by >10% of tapentadol ER-treated patients included nausea, dizziness, somnolence, and constipation.

Conclusions: In patients with painful DPN, tapentadol ER was effective and well tolerated in a 12-week randomized-withdrawal study, with greater maintenance of improvement in health status than placebo.

Conflict of interest:
Employee: AO, DYS, and ME are employees of Johnson & Johnson.
BL and RL are employees of Grünenthal GmbH.

Oral agents in type 2 diabetes (2)

D-0832

Thiazolidinediones but not sitagliptin exacerbate ovariectomy-induced bone loss in rat

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Recent reports have established that thiazolidinediones (TZDs) increase risk of bone loss and fracture in patients with type 2 diabetes. Sitagliptin (Sita) represents a new class of antihyperglycemic agents and is a potent and selective inhibitor of dipeptidyl peptidase-4 (DPP-4). In this head-to-head study, we investigated effects of rosiglitazone (Rosi), pioglitazone (Pio), and Sita on ovariectomy (OVX)-induced bone loss in Sprague Dawley rats. OVX rats were treated once daily by oral gavage for 3 months with vehicle (Veh), Sita (100 and 300 mg/kg), Rosi (5 and 30 mg/kg), or Pio (5 and 30 mg/kg). The bone-resorption inhibitor alendronate (ALN) (0.015 mg/kg; 2x/wk, sc) was used as a control and prevented OVX-induced loss in bone mineral density (BMD). A sham-operated group was included. No significant treatment related changes in body weight or glucose were observed among different groups, however fat body mass and fat content in femur were increased by TZDs. TZDs at 5mg/kg ($p<0.05$) and 30 mg/kg ($p<0.01$) significantly exacerbated OVX-induced loss of BMD in the whole femur, while Sita was without effect. At the central femur, OVX did not induce significant BMD loss; however, both TZDs (at 30 mg/kg), but not Sita, significantly reduced regional BMD, cortical thickness and cortical area ($p<0.05$) in the OVX rats. The effect of both TZDs exacerbating OVX-induced bone loss was also evident in the proximal and distal femur, but not in the metaphyseal region of the distal femur. Moreover, TZDs significantly ($p<0.05$) exacerbated loss in lumbar spine BMD by 9-10% under all conditions tested. Caudal vertebrae BMD, though unaffected by estrogen-deficiency, was markedly reduced by TZDs (10-14%; $p<0.05$). In contrast, Sita, at dosages which achieved near complete inhibition of plasma DPP-4, had no significant or dose-related effect on any of the above bone parameters. Dynamic histomorphometry to mechanistically elucidate bone cell activities and bone marrow adiposity at the above skeletal sites in TZD and Sita treatment groups is ongoing. These data highlight important differences between sitagliptin vs. the TZD class in this rodent model of high bone turnover and suggest that sitagliptin, unlike TZDs, has no adverse effect on bone mineral density.

Conflict of interest:
Stock ownership: Merck & Co.
Employee: Merck & Co.

D-0833

Pioglitazone and sitagliptin compared to pioglitazone and metfomin therapy on glycaemic control and on insulin resistance in type 2 diabetic patients

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Aims: our study aimed to compare the effects of pioglitazone (P) plus sitagliptin (S) vs pioglitazone (P) plus metformin (M) on glycemic control and on insulin resistance related-parameters in type 2 diabetic patients.
Methods: ninety-nine type 2 diabetic patients with uncontrolled type 2 diabetes mellitus (HbA1c > 7.5 %) were randomised to P 30 mg o.d. and S 100 mg o.d. or to P 15 mg b.i.d. and M 850 mg b.i.d. All type 2 diabetic patients were resulted not well controlled with diet and physical activity and P at dosage of 30 mg/day. The treatment period had a 9 months duration. We evaluated BMI, HbA1c, FPG, PPG, FPI, Homa index and collected plasma samples of adiponectin (ADN), resistin (R), tumor necrosis factor-alpha (TNF-a), and high-sensitivity C reactive protein (Hs-CRP) at baseline, and after 9 months.
Results: ninety-two patients completed the study (46 in PS and 46 in PM group). BMI was significantly reduced by PM, but not by PS (from 27.8±1.4 to 27.4±1.1 Kg/m^2, ns vs baseline, and from 27.6±1.2 to 26.8±0.9 Kg/m^2, p< 0.05 vs PS, respectively). HbA1c was decreased by 1.1±0.07 % (p< 0.01), and by 1.3±0.09 % (p< 0.01); FPG was reduced by 17±3 mg/dl (p< 0.01), and by 23±4 mg/dl (p< 0.01); PPG was decreased by 29±5 mg/dl (p< 0.01), and by 31±6 mg/dl (p< 0.01), in PS and PM group, respectively. FPI was decreased by 3.0±0.2 mU/ml (p< 0.05), and by 3.9±0.3 mU/ml (p< 0.01 vs baseline, p< 0.05 vs PS), and Homa index by 1.6±0.5 (p< 0.05), and by 2.1±0.6 (p< 0.01 vs baseline, p< 0.05 vs PS) in PS and PM group, respectively. ADN was increased by 0.2±0.002 mg/ml (ns vs baseline), and by 1.2±0.2 mg/ml (p< 0.05 vs baseline, p< 0.05 vs PS), in PS and PM group, respectively. Resistin was reduced by 0.2±0.001 ng/ml (ns vs baseline), and by 2.2±0.3 ng/ml (p< 0.05 vs baseline, p< 0.05 vs PS), TNF-a by 0.2±0.001 ng/ml (ns vs baseline), and by 1.0±0.3 ng/ml (p< 0.05 vs baseline, p< 0.05 vs PS), and Hs-CRP by 0.7±0.005 mg/l (p< 0.05), and by 0.7±0.005 mg/l (p< 0.05), in PS and PM group, respectively. There was a significant correlation between Homa index decrease and ADN increase (r= -0.57, p< 0.01), R decrease (r= 0.55, p< 0.01), and TNF-a decrease (r= 0.53, p< 0.01).
Conclusion: both combinations ameliorated diabetes control, but only PM improved insulin resistance related-parameters. The ADN increase, R and TNF-a decrease seem to be related to Homa index improvement.

No conflict of interest

D-0834

Pioglitazone-based fixed-dose triple combination therapy in office practice for type 2 diabetes in a resource-limited Indian Setup – PRIDE III Study PRIDE III investigators

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Aim: There is insufficient data on the use of a pioglitazone-based fixed-dose triple drug therapy in the treatment of type 2 diabetes mellitus (DM). We aimed to evaluate the safety and efficacy of a fixed-dose combination of pioglitazone (PG), metformin (MF) and glimepiride (GP) in the management of type 2 DM patients in a resource-limited Indian setup.
Methods: The study was conducted as a prospective, open, multicentric, non-comparative cohort study. Included patients were >18 years old, of either sex and inadequately controlled (glycated hemoglobin >7%) with mono- or dual therapy using sulfonylurea or MF or a thiazolidinedione; or if there was non-adherence with three different oral agents. Cardiac, renal or hepatic dysfunction were exclusion criteria.
The 1534 patients selected (mean age = 55 years, body weight = 66 kg, BMI = 25.46 kg/m^2) were started on a combination of PG (15 mg), MF (500 mg; slow release) and GP (1 or 2 mg, depending on glycemic values at inclusion). Patients were asked to continue their medications for concomitant illnesses. Baseline values for fasting plasma glucose (FPG) and post-prandial plasma glucose (PPG) and glycated hemoglobin (HbA1c) were measured. FPG and PPG were measured at 3-weekly intervals and HbA1c was measured after 3 months. The paired t-test was used for before-after comparisons. P<0.05 was taken as significant.

Results: Mean values for FPG, PPG and HbA1c decreased significantly from baseline during the course of therapy over 3 months (Table 1) and 752 (49%) of overall patients reaching the FPG treat-to-target goal. Triple combination therapy was well tolerated throughout the study. There were no reports of patient withdrawal due to elevated hepatic enzymes.

Table: Glycemic control at baseline and after 3 months

	Baseline	After 3 months	P value
Fasting plasma glucose*	194.43	117.2	<0.05
Post-prandial plasma glucose*	287.34	166.67	<0.05
Glycated hemoglobin	8.94%	6.93%	<0.05

* Units: mg/dl

Discussion: In patients with type 2 DM uncontrolled on mono- or dual therapy, fixed-dose triple drug combination therapy of PG, MF and GP significantly improved glycemic control with an acceptable tolerability profile. This therapy can, potentially, reduce the problem of treatment non-adherence. Though our study did not evaluate the effect of combination therapy in patients taking insulin, the synergistic effect of PG, MF and GP can reduce the insulin requirement significantly. For patients poorly controlled on mono- or dual therapy, our study makes a strong case for triple combination therapy as an attractive alternative to insulin.

No conflict of interest

D-0835

Effect of pioglitazone and metformin fixed-dose combination on biomarkers of inflammation and dyslipidemia in patients with type 2 diabetes

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Inflammation and dyslipidemia are recognized markers of cardiovascular risk in type 2 diabetes mellitus (T2DM). This 24-week, double-blind trial compared efficacy and safety of a fixed-dose combination of pioglitazone/metformin (PIO/MET) with respective monotherapy in T2DM patients who had stable HbA1c for 3 months on no antidiabetes medications. The primary endpoint was change from Baseline in HbA1c. Changes in hs-CRP, triglycerides, and lipid fractionations were secondary endpoints.

Measurements of hs-CRP showed significant decrease from Baseline to Week 8 and Week 24/Final Visit with PIO/MET compared with MET monotherapy, and PIO monotherapy showed significant decrease compared with MET at Week 8 (Table 1).

Table 1: Median Percent Change from Baseline in hs-CRP by Study Visit

	PIO 15 mg BID/MET 850 mg BID N=201	PIO 15 mg BID N=189	MET 850 mg BID N=210
Baseline Median, mg/L	3.545	2.885	3.08
Median Percent Change from Baseline			
Week 8	–36.33	–31.8	–12.32*†
Week 24/Final Visit	–36.7	–34.03	–26.22*

*P<0.05 vs PIO/MET therapy. †P<0.01 vs PIO. BID = twice daily.

Triglycerides decreased from Baseline to Final Visit in all 3 treatment groups (not statistically significant), with the largest decrease in PIO/MET (–5.95%), followed by PIO (–5.54%) and MET (–1.78%) monotherapies. High-density lipoprotein cholesterol (HDL-C) increased from a mean Baseline of 42.6 mg/dL to Final Visit in all 3 groups. The highest increase was with PIO/MET (14.20%), followed by increases in PIO (9.88%, P<0.05) and MET (6.09%, P<0.0001 compared with the combination).

PIO/MET and PIO therapies resulted in mean increases of 1.19% and 6.08% from Baseline, respectively, in low-density lipoprotein (LDL). Mean LDL particle concentrations decreased in all 3 treatment groups, with greater decreases observed in the PIO/MET and PIO groups than in the MET group (not statistically significant). Increases in LDL mean particle size were greater (P<0.001) in the PIO/MET and PIO groups than in the MET group (Table 2).

Table 2: LS Mean Change from Baseline in LDL-C Fractionation

	PIO 15 mg BID/MET 850 mg BID N=201	PIO 15 mg BID N=189	MET 850 mg BID N=210
LDL Particle Concentration			
Baseline, nmol/L	1460.9	1517.1	1471.2
Change, Baseline to Final	–240.6	–217.2	–176.4
LDL Mean Particle Size			
Baseline, nmol/L	20.28	20.31	20.35
Change, Baseline to Final	0.55	0.60	0.20*†

*P<0.0001 vs PIO/MET therapy. †P<0.0001 vs PIO. BID = twice daily.

Incidences of adverse events were 50.7% for PIO/MET, and 52.1% and 53.1% for PIO and MET, respectively. In conclusion, PIO/MET and PIO monotherapy improved a marker of inflammation and indices of diabetes dyslipidemia compared to MET.

Conflict of interest:
Employee: A. Perez and Z. Zhao are employees of Takeda Global Research & Development Center, Inc. R. Spanheimer is an employee of Takeda Pharmaceuticals North America.

D-0836

Does magnesium replacement improve insulin resistance in patients with metabolic syndrome? A 12-week randomized double bind study

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Magnesium (Mg) is an important metallic co-factor for fundamental enzymes to intracellular insulin signaling. Studies have shown reduced Mg levels in patients with insulin resistance (IR), high blood pressure, and metabolic syndrome (MS).

Aim: To evaluate the effect of magnesium (Mg) replacement on insulin resistance and cardiovascular risk factors in patients with metabolic syndrome without diabetes.

Methods: This 12-week clinical randomized double blind study compared the effects of 400 mg/day of chelated Mg with those of a placebo (n=72) on weight, blood pressure, fasting glucose, insulin, HOMA-IR, lipid profile, and C reactive protein (CRP). Mg was measured in serum (SMg) and in mononuclear cells (MMg). The study was approved by a local ethical committee.

Results: Hypomagnesaemia (SMg<1.7mg/dL) was seen in 23.2% and intracellular depletion in 36.1% of patients. MMg concentrations were lower in patients with obesity (0.94 ± 0.54 *vs*. 1.19 ± 0.6 µg/mg of proteins, P=0.04), and insulin resistance (0.84±0.33 *vs*. 1.14±0.69 µg/mg of proteins, P<0.05). Mg replacement in the usual dose (400mg/day) did not change SMg (1.82±0.14mg/dL *vs.* 1.81±0.16mg/dL, P=0.877) and tended to increase MMg (0.90±0.40 *vs*. 1.21±0.73, P=0.089). Mg replacement was well tolerated, and there were no relevant side effects, which occurred in the same proportion in patients taking Mg or placebo: slight epigastric pain (5.4% *vs*. 8.6%), nausea (2,7% *vs*. 5,7%), and diarrhea (2,7% *vs.* 2,9%), that did not require treatment or interruption of medications. Both groups lost weight, but only in the Mg group a modest fall in systolic blood pressure (134±12 *vs.* 124±27 mmHg, P=0.004) was observed, even though the changes in the averages after treatment when the groups were compared, were not statistically significant (–8.5±27.8 *vs*. –4.0±19.7, P= 0.498). Fasting blood sugar showed a tendency to fall in magnesium group (104±16 vs.102±12 mg/dL, P=0.09). HOMA-IR reduced in both groups, but the averages difference was not statistically significant. There was no change in lipid profile or in CRP.

Conclusions: Serum and intracellular Mg depletion is common in patients with Metabolic Syndrome (MS), especially in obese and insulin resistant. Mg replacement did not increase significantly Mg levels, in spite of the recommended replacement dose. As insulin resistance can impair Mg entrance into the cells, increasing doses and/or administering Mg replacement for more prolonged periods should be tested to evaluate the benefits of Mg replacement in these patients. Patients are presently being followed to evaluate the incidence of diabetes mellitus or glucose intolerance in both groups.

No conflict of interest

D-0837

Safety and effectiveness of biphasic insulin aspart 30/70 (BIAsp 30) used with different combinations of oral antidiabetic drugs in patients with type 2 diabetes: results of the IMPROVE™ study

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Aims: Many oral antidiabetic drugs (OADs) are combined with biphasic insulin aspart 30/70 (BIAsp 30) to treat type 2 diabetes. We investigated whether OAD choice affected safety and effectiveness outcomes.

Methods: We analysed data from patients taking BIAsp 30 with biguanides (B), sulphonylurea (S), biguanides and S (B+S), acarbose (A) or thiazolidinediones (T) during the 26-week IMPROVE™ study. Only patients who did not change treatment during the study were included (n=9396).

Results: At the end of the study all measures of glycaemic control were significantly reduced in all subgroups (p<0.001), with a trend to greater reductions in the BIAsp 30+A and BIAsp 30+T subgroups. Thus, more patients reached HbA_{1c}<7% in these subgroups (Table). Weight change was not significant in most subgroups, although small but significant changes were seen in the BIAsp 30+B (-0.3 kg) and the BIAsp 30+T (+0.4 kg) subgroups. Rates of major hypoglycaemia were significantly reduced in all subgroups except in the BIAsp 30+A subgroup (the reduction was not significant). Rates of minor hypoglycaemia were significantly reduced in the BIAsp 30+S and BIAsp 30+B+S subgroups and increased significantly in the BIAsp 30+A subgroup.

Conclusions: BIAsp 30 combined with any OAD effectively controls glycaemia with a low risk of hypoglycemia or weight gain. Caution should be applied when BIAsp 30 is used with acarbose, due to the slight increase in minor hypoglycaemia.

See table 1

Conflict of interest:
Paid lecturing: P Valensi, Novo Nordisk R Kawamori, Novo Nordisk
Advisory board: P Valensi, Novo Nordisk
Employee: Z Bosnyak, Novo Nordisk

Table 1

Parameter (SD)	BIAsp 30+B	BIAsp 30+S	BIAsp 30+B+S	BIAsp 30+A	BIAsp 30+T
	n=4343	n=978	n=2948	n=624	n=503
Age, years	55.9 (11.2)	57.0 (12.4)	54.3 (10.0)	59.3 (13.4)	54.8 (12.6)
Sex ,% (male)	53	53	56	60	64
Diabetes duration, years	7.4 (6.0)	8.0 (6.2)	8.2 (5.6)	7.7 (6.9)	6.7 (5.9)
Mean HbA_{1c}, %					
Baseline Change	9.3 (1.8) -2.1 (1.9)*	9.1 (1.6) -1.7 (1.5)*	9.2 (1.7) -1.8 (1.7)*	9.4 (2.1) -2.5 (2.1)*	9.5 (2.0) -2.6 (2.0)*
Patients reaching HbA_{1c}<7%, %	48.8	33.1	35.5	61.6	59.4
Mean FBG, mmol/L					
Baseline Change	10.7 (3.0) -3.9 (3.2)*	10.3 (2.8) -3.5 (2.7)*	10.4 (2.9) -3.7 (2.8)*	10.9 (3.5) -4.4 (3.4)*	11.0 (3.3) -4.4 (3.1)*
Mean PPBG breakfast, mmol/L					
Baseline Change	14.2 (4.5) -5.9 (4.5)*	14.3 (4.0) -5.3 (3.9)*	14.8 (4.0) -5.7 (4.0)*	15.3 (5.0) -6.9 (4.9)*	15.5 (4.2) -6.9 (4.2)*
Mean PPBG lunch, mmol/L					
Baseline Change	12.8 (3.7) -4.3 (3.7)*	12.8 (4.1) -3.9 (3.6)*	13.9 (4.3) -4.6 (3.6)*	13.2 (4.2) -4.7 (4.1)*	14.1 (4.5) -5.5 (4.0)*
Mean PPBG dinner, mmol/L					
Baseline Change	11.4 (3.0) -3.6 (3.2)*	10.5 (2.5) -2.6 (2.5)*	10.7 (2.7) -2.9 (2.8)*	12.0 (3.2) -3.9 (3.4)*	12.3 (3.8) -4.7 (4.0)*
Mean weight, kg					
Baseline Change	77.7 (17.6) -0.3 (4.3)*	69.4 (14.0) -0.3 (3.2)^{NS}	70.1 (14.4) -0.0 (3.6)^{NS}	67.3 (13.1) -0.1 (3.0)^{NS}	68.4 (12.2) +0.4 (2.8)*
Major hypoglycaemia, events/patient year					
Baseline Change	0.136 -0.128*	0.151 -0.147*	0.075 -0.068*	0.071 -0.064^{NS}	0.167 -0.159**
Minor hypoglycaemia, events/patient year					
Baseline Change	3.565 -0.021^{NS}	2.619 -1.236*	1.540 -0.565*	2.521 +1.250**	3.877 -0.594^{NS}

*p<0.001, **p<0.05, NS = not significant
FBG=fasting blood glucose; PPBG=postprandial blood glucose

D-0838

Miglitol, an alpha-glucosidase inhibitor, decreases gene expressions of inflammatory cytokines/cytokine-like factors in peripheral leukocytes in parallel with the reduction in blood glucose fluctuations in patients with type 2 diabetes

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Background and aims: Many patients with type 2 diabetes are treated with a-glucosidase inhibitors, which have beneficial effects in improving postprandial hyperglycemia. Miglitol, an a-glucosidase inhibitor, is more potent in reducing early postprandial blood glucose than other a-glucosidase inhibitors, such as acarbose and voglibose, and delays the peak of postprandial glucose. In this study, we focused the daily blood glucose fluctuations and gene expressions of inflammatory cytokines/cytokine-like factors in patients with type 2 diabetes and examined the effects of the switch from acarbose or voglibose to miglitol on them.

Methods: The subjects comprised 43 patients with type 2 diabetes (22 men and 21 women) aged 26–81 years with HbA_{1c} levels from 6.5% to 7.9%. They had received combination therapy with acarbose (100 mg/meal) or voglibose (0.3 mg/meal) and insulin or sulfonylurea for more than six months. At the start of the study, all alpha-glucosidase inhibitors were switched to miglitol (50 mg/meal) and the new treatments were continued for three months. At each end of the study period, basic clinical parameters, such as HbA_{1c}, fasting glucose, triglyceride, total-cholesterol and C-reactive protein, were measured, and the severity of adverse events, such as hypoglycemia, fecal disturbance (diarrhea/constipation), flatulence and abdominal distention were monitored. Blood glucose was determined just before and one hour after meals by self-monitoring. Gene expressions of inflammatory cytokines/cytokine-like factors in peripheral leukocytes were determined by real-time RT-PCR.

Results: The levels of HbA_{1c} and fasting blood glucose were maintained even after acarbose or voglibose was switched over to miglitol. Meanwhile, hypoglycemic events were significantly reduced by 58% (p<0.001) after the change of treatments. Blood glucose fluctuations were ameliorated and the M-value was decreased by 24% (p<0.001). In peripheral leukocytes, the gene

expression levels of IL-1ß, TNF-a, S100a4, S100a6, S100a9, S100a10, S100a11 and S100a12 were significantly decreased by 25% ($p<0.01$), 24% ($p<0.001$), 17% ($p<0.05$), 20% ($p<0.05$), 23% ($p<0.05$), 19% ($p<0.01$), 25% ($p<0.01$) and 24% ($p<0.05$), respectively.

Conclusion: After the switching from other alpha-glucosidase inhibitors, miglitol improved blood glucose fluctuations without changes in HbA_{1c} and fasting blood glucose in patients with type 2 diabetes. On the other hand, miglitol also decreased the gene expressions of inflammatory cytokines/cytokine-like factors in peripheral leukocytes. These results suggest that the blood glucose fluctuation may affect the gene expressions of inflammatory cytokines/cytokine-like factors in peripheral leukocytes in type 2 diabetes.

No conflict of interest

D-0839

Efficacy and tolerability of alpha-glucosidase inhibitors: a systematic review and meta-analysis of clinical trials

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Aims: The purpose of the study was to conduct a systematic literature review and meta-analysis to compare the efficacy (glycemic control) and tolerability (hypoglycemia, gastrointestinal events) of Alpha-Glucosidase inhibitors (AGIs) vs. other oral antihyperglycemic agents (OAHAs) in patients with type 2 diabetes.

Methods: Four databases including MEDLINE, Science Citation Index (SCI), Cochrane Central Register of Controlled Trials (CENTRAL) and EMBASE were searched to identify related randomized controlled clinical trials (RCTs) published between 1966 and 2008. After screening, 22 studies were identified. AGIs were used as monotherapy in 9 studies and as adjunct therapy with other OAHAs in the remaining 13 studies. In most studies, AGI was compared to metformin and sulfonylurea (SU) mono- or combination therapy. Acarbose is the AGI that has been most extensively studied.

Results: For each study identified, qualitative summary, number of events, and relative risk (RR) estimates related to glycemic control, hypoglycemia and GI events were extracted. Fixed effect models were employed to estimate the pooled effects. When pooled effect on change in mean HbA1c level was estimated, studies that had placebo as control were excluded. All analyses were performed using STATA9. The pooled results showed that, as compared to patients taking other OAHAs, diabetic patients using AGIs had similar change in mean HbA1c level [Difference in change of mean HbA1c: -0.013% (-0.136, 0.111); Baseline HbA1c: 7.8-10.6%], two times more GI adverse events [Pooled RR: 2.17(1.92, 2.47)] and 56% less hypoglycemia cases [Pooled RR: 0.64 (0.44, 0.83)]. The decreased risk of hypoglycemia is likely due to the fact that sulfonylurea mono- or combination therapy was often the control group in RCTs and SU are known to increase the risk of hypoglycemia.

Conclusion: In summary, the pooled results suggest that, as compared to other OAHAs, AGIs have similar efficacy, are associated with increased risks of GI events and decreased risks of hypoglycemia. Considering that AGIs have been commonly used in the Asia Pacific region, there is a need to identify other OAHAs that have better efficacy and tolerability than AGIs.

Conflict of interest:
Employee: Dr. Ying Qiu and Dr. Larry Radican are Employees of Merck and Company.
Commercially-sponsored research: This study was sponsored by Merck and Company, Whitehouse Station, NJ, USA

D-0840

A meta-analysis of the effect of oral antidiabetic agents on A1C levels at 12 weeks

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Aim: Pharmacological treatment of type 2 diabetes requires the use of single or multiple oral antidiabetic (OAD) agents. Various clinical guidelines outline the expected decrease in A1C level with the initiation of an OAD. However, the estimated drop in A1C for each class of agents that is listed in these guidelines is based on qualitative summaries of primary studies of varying rigour and validity and not on a careful synthesis of relevant studies. The purpose of this review is to systematically identify randomized double-blind, placebo-controlled trials of adequate methodologic quality and meta-analyze the results at 12 weeks.

Methods: A comprehensive literature search of three electronic databases (Cochrane, Embase and Medline) from January 1980 to March 2007 identified 4319 citations. All randomized double-blind placebo-controlled trials that assessed the effectiveness of currently available OAD agents to reduce A1C levels in non-pregnant adult individuals with type 2 diabetes were reviewed. Eligible studies must also meet the following criteria: published in English, peer-reviewed journals; sample size of at least 50 participants in each study arm; duration of at least 12 weeks; and had at least 70% follow up in each arm at 12 weeks. In total, 83 of 4319 (1.9%) citations met the eligibility criteria for the meta-analysis.

Results: Only 14 of the eligible trials provided 12 week data. These trials involved 6 classes of drugs and the meta-analyses are summarized in the table.

Drug	# of Studies	Treatment Effect			
		Dose	Mean Difference	95% C.I.	p-value
Alpha Glucosidase Inhibitors	2	300 mg	-0.56	(-1.14, 0.02)	0.057
DDP-4 Inhibitors	2	200 mg	-0.75	(-1.22, -0.28)	0.002
Lipase Inhibitor	2	360 mg	-0.41	(-0.59, -0.24)	< 0.001
Meglitinides	2	260 mg	-0.61	(-0.83, -0.38)	< 0.001
Secretagogues	3	20 mg	-1.24	(-1.61, -0.88)	< 0.001
TZDs	3	8 mg	-0.80	(-1.25, -0.36)	< 0.001

Discussion: The 12 week results demonstrate the effect of various OADs, with secretagogues and TZDs demonstrating the greatest drop in A1C. Continuing meta-analyses of data from 1.9% of the included trials will provide clinicians with evidence-based information of the effectiveness of different OAD agents over various time points. Additional analyses will determine the effect of age, sex, ethnicity, background therapy and OAD agent dose on the changes in A1C.

Conflict of interest:
Commercially-sponsored research: Merck Frosst sponsored the systematic review and meta-analysis.

EDUCATION

Innovative education tools and IT application to diabetes education

D-0841

Revising and up-dating an educational tool to promote understanding of diabetes physiology

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Background: Bodylink was originally produced by Boehringer Mannheim and has been used successfully in diabetes education programmes since 1992, but is no longer available. Bodylink delivers information about diabetes physiology in an interactive format by manoeuvring tokens and symbols around a three-dimensional board.

Aims: To design and produce an interactive, flexible educational tool utilising the Bodylink format in collaboration with Roche diagnostics.

Methods: The educational tool (Accu-Chek Diabetes Link) was designed to support a philosophy of patient empowerment and experiential learning. A professional graphic design team was employed to produce a cost-effective, portable, versatile instrument that could be used in routine clinical care. Accu-Chek Diabetes Link includes an A1 poster with an outline of a body with diagrams of key organs relating to diabetes. Interactive tokens representing relevant hormones, glucose, ketones and lipids and symbols denoting the effects of exercise, pregnancy and alcohol have been designed and can be moved around the diagram of the body to encourage active involvement and

to promote links with individual experiences. Accu-Chek Diabetes Link can be utilised to explore physiology of diabetes, hyper and hypoglycaemia, stress responses and tissue damage associated with diabetes. A4 printed handouts of the Accu-Chek Diabetes Link are available for the patients' reference.

Discussion: Subjective evaluation of this educational tool in patient education sessions has shown positive feedback. Patients report increased knowledge and have been able to relate this to self-care practices. It has also encouraged the application of different teaching methods to support various learning styles and has aided development of problem solving. By changing the emphasis from formal teaching with lengthy explanations to brief visual images and active participation, connections are more easily made between personal experience and physiology and this focuses available time on relevant topics. The design of Accu-Chek Diabetes Link allows reinforcement of previous learning and can be used to build information incrementally to prevent information overload.

Conclusion: A revised, up-dated interactive educational tool to promote understanding of diabetes physiology has been designed and produced and is being applied in clinical practice.

No conflict of interest

D-0842

Storybook teaching tool - a happy ending for expectant mothers

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Background: Located in a dense, residential area of Toronto, the Gestational Diabetes Program of our busy community teaching hospital serves a high risk multicultural population. A high referral rate from surrounding Primary Care providers and the hospital's busy Obstetrical service results in 6 – 9 new referrals per week.

Our teaching team, comprised of a Diabetes Nurse Educator and a Registered Dietitian delivers the essentials of glycaemia self-management in a 90-minute session for small to mid-sized classes of expectant mothers accompanied by family. Participants are culturally diverse, and of varying education and literacy levels. Often, no two participants share the same language of origin.

Inconsistency in the uptake of basic concepts motivated the team to welcome an innovative educational approach.

Aim: To reduce fetal and maternal complications associated with gestational diabetes by facilitating timely acquisition of concepts of glycaemia self-management principles in pregnancy. Our challenge was to improve our delivery of these concepts in this diverse group setting while staying within our 90-minute class time frame. We sought to create a universal group teaching tool that could achieve these goals.

Method: A large storybook design was conceived and constructed by the Nursing student. Essential concepts are communicated primarily with sequenced pictures highlighting the benefits of healthy eating, physical activity and monitoring/recording after-meal blood sugars. Sections of the storybook incorporate a removable insulin pen and a dinner plate that can be assembled with food models to facilitate carbohydrate-counting.

In-class trials lead to edits that helped clarify concepts. A 3-ring binder design allowed for removal of entire poster pages for focusing on single concepts or individual learning. Focused interviews with participants after their teaching session will be conducted to qualitatively evaluate this educational tool.

Results: We observed that the giant storybook design captured the attention of class participants, and invited broader interest from attending family members. We immediately noted that question time at the end of class shortened by 10min.

At clinic follow-up, educators noted improved adherence to self-management concepts.

Discussion: Expectant mothers faced with learning self-management of high blood sugar in pregnancy can feel overwhelmed by frequent blood glucose testing and the possibility of starting insulin. Mothers and families may require more support, yet educator time is limited. The storybook format invited increased class participation and accelerated uptake of essential concepts. The picture book was portable, not dependent on technology, reproducible and culturally adaptable.

No conflict of interest

D-0843

Patient education - a new dietary dimension

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Background: The prevalence of Diabetes Mellitus and its associated complications in India have increased drastically. One should start at early diagnosis of diabetes so that complications can be avoided (Secondary Prevention). At present diabetes prevention is centered on preventing the complications of Diabetes (Tertiary Prevention). At the same time, those at higher risk of Diabetes should be identified and preventive therapy should be started (Primary Prevention). To prevent and to treat Diabetes life style modifications play a major role. As India has diversified cultures so are the eating habits and serving size, a live display of various food items from different communities can help each subject to understand and opt for healthy food in the right quantity.

Aim: To educate Subjects with Diabetes from various communities about diet, nutrition and serving size so as to make healthy food choices via a live food display on November 16th, 2008 at S.L.Raheja Hospital.

Materials and Methods: 135 subjects with diabetes from various communities were educated with the help of posters, household measurements, standard measuring cups and spoons, caloric charts, food display of 227 food items explaining the nutrients, calories, standardized portion size of both healthy and unhealthy food. We have included all food items that are readily available and consumed in different parts of India. This helped the participants to understand about the different cuisines available which they can include in their regular meals. Each food item was displayed with its caloric and nutrient content. Caloric charts explained the 100 kilocalories exchange in brief and individual diet consultation helped to correlate the exchange list and the food that is displayed.

Results: The interactive session revealed that 97% of the subjects had misconceptions about the nutritional facts of various food items, quantity of various food items as per the calories, food choices and varieties of dishes and food. 90% of the subjects were not having the proper knowledge about the diet to be consumed during the religious fasts, festivals and restaurants

Discussion: Since India's culture and eating habits are diversified, a self assessment to choose the right food as per their eating habits helps them to understand the diet better than just giving diet chart. It is easy for a person with diabetes to understand the portion size, caloric content, permitted food and nutrients. The Education Program conveyed the importance and flexibility to follow an individualized diet to 135 subjects with diabetes.

No conflict of interest

D-0844

The creation and evolution of diabetes conversation luncheon map

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Background: The medical team in our clinic focuses on the importance of "educating the people with diabetes". There are some approaches to facilitate individual interventions and small group education programs. Meanwhile, a drawing with a message, as an appealing way that we are always here and our communication lines are open to each patient, is posted every month in the waiting hall. These hand-drawings and messages work on them quietly and inspire their aspiration. The conversation luncheon map was made by the same concept to reflect their mind by the method of metaphor.

Aims: As a support tool for our monthly diabetes awareness class, we have created our own diabetes conversation luncheon map (A3 size). We offered to use this map as an interactive learning tool and also to look at their life from the birds-eye view.

Materials and methods: This map has instituted to include the use of visual art works in conjunction with the "awareness enforcer" promoted by an emphasis on a multifaceted approach to lifestyle optimization, providing information on the diagnostic procedure, possible causes, complications, treatments and control and evaluation of symptoms, stress coping strategies, self-dialogue, aspirations and goals (9 items). We connect the map and the 9 items as a cognitive power. The concept was initially introduced to us at the US Diabetes Conversation Maps Seminar held as part of 2007 annual meeting of ADA in Chicago. We were encouraged to create our original conversation map in Japanese.

Results: This program has become more effective in encouraging active participation as the results of questionnaire after the class. In addition we made memo cards each corresponding to one of the 9 items to help to inspire smooth and effective dialogues between patients with diabetes and the medical professionals. The laminated map can also be used at home as the tool for improving awareness of family members as well as patients. This map is also used in newly diagnosed patients with diabetes and objective data are collected with regard to efficacy of the map as a tool. Concerning the case study, for example, a 74-age male diabetic patient with recognition disorder could catch the awareness not only to familiarize himself with the 9 items of our holistic approach but also to bring him the meaning of the wholeness of his life by using the map. As a result, his HbA1c was improved from 7.6% to 6.3% after 3months. Another two cases are reported in the poster session. And in these three cases, cerebral MRI and SPECT were done. Mini-Mental State Examinations before and after applying the map were also done. Their responses to the map were remarkable and their QOL were improved.
Conclusion: Our original diabetes conversation luncheon map is effective in diabetes education.

No conflict of interest

D-0845

Development of nutrition education resources for educators and consumers

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Aim: To develop teaching tools that will enable diabetes educators to implement the recommendations in the *Canadian Diabetes Association 2008 Clinical Practice Guidelines for the Prevention and Management of Diabetes in Canada*.
Healthcare professionals across Canada are using many diverse and sometimes conflicting tools to educate people with diabetes. The aim was to produce resources that could be used across the country to help health professionals implement the Clinical Practice Guidelines.
Who we are: The committee consists of diabetes educator volunteers (dietitians, nurses, pharmacists) from across Canada who believe that people with diabetes should have access to consistent accurate information about the management of their diabetes regardless of their geographic location. The committee was formed in September 2000, and has since created 8 resources: *Just the Basics, The Glycemic Index, Basic Carbohydrate Counting, Sugars & Sweeteners, Alcohol & Diabetes, Cholesterol & Diabetes, Eating Away from Home and Managing Weight & Diabetes.* This year, 2009, the committee is working on a hypertension resource.
Method: A survey is completed yearly at the Canadian Diabetes Association/ Canadian Society of Endocrinology and Metabolism (CDA/CSEM) Professional Conference to determine the topic for resource development. Once the topic is chosen, the committee is divided into working groups researching the different components and creating a draft. The committee meets monthly to define the content of the tool. A designed hard copy of the draft resource is sent out to healthcare professionals for their feedback. All feedback is collated and assessed. The resource is revised based on the feedback received. It is then printed and launched at the following CDA/CSEM Professional Conference. As well, the committee develops additional supporting materials that are available for reference and downloading on the Canadian Diabetes Association website, www.diabetes.ca, along with the resource. Several months after the launch of the tool, a survey is sent to diabetes educators across Canada to evaluate the impact and use of the tool.
Conclusion: The results to date have been quite favourable. The resources are displayed on this poster.

No conflict of interest

D-0846

A digital tool to assist front-line physicians to self diagnose their continuing professional development (CPD) needs, to maintain medical expertise in diabetes

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Aims: To comply with the Code of Ethics of their regulatory authority, all Quebec physicians are required to maintain their competence. Self-managed CPD plans are offered to ensure a reflective approach to the overall self-analysis of their practice and core competencies based on the CanMEDS framework. Several authors question the validity of the clinical competencies self-assessment. Our research aims to develop an online prototype to self-diagnose CPD needs in the diabetes mellitus domain, targeting front-line physicians; evaluating tool satisfaction; and assessing usefulness to CME stakeholders.
Methods: This collaborative research and development project, carried out with stakeholders in the field, comprises 4 phases: 1) needs analysis and preliminary tool design; 2) collaborative re-design; 3) prototype development; 4) usability testing. The modeling technique proposed in the *MISA™* as well as the *Expert & Learner Verification and Revision* approach were used to design and validate the tool's utility profile.
Results: The first 3 phases are complete. Phase 1: A survey among 153 physicians confirmed a need for a self-assessment tool for expertise in diabetes and allowed us to recruit a potential of 59 volunteers for phase 4. The formative system blueprint of the self-assessment tool is based on CDA guidelines, and its design has been developed in a constructivist perspective and principles of the *Competent Situated Action* approach. A mockup using the *infoCompétences+* tool was validated by an endocrinologist and two target physicians. Phase 2: Detailed specifications and a non-functional prototype (*Diabète*Compétences+)* were validated by 6 specialists in the fields of Endocrinology, CME and educational technology. A self-diagnostic process juxtaposes the physicians' needs and the results of a self-assessment of their medical expertise in diabetes. Automated features help perform analyses, develop an action plan and generate anonymous, individual or group statistics. Phase 3: The tool content was approved by a specialist in Endocrinology, and 3 Category 1 credits awarded by the FMOQ confirmed the tool's educational intent based on recognized accreditation criteria.
Discussion/conclusion: Based on performance standards, the process (3 hrs) is educational and anonymous, which may increase the validity of the self-assessment. Creating a holistic view of and situational approach to competency, the tool enables users to identify their CPD needs and note potential care gaps and barriers to clinical application of guidelines. The tool could be used in combination with self-managed CPD plans to facilitate the creation of a diabetes action plan, or as an electronic tool for CME professionals to identify group needs for future learning/practice resources. Testing will be conducted on a larger scale in spring '09 to further assess the prototype's educational and usage value (phase 4).

Conflict of interest:
Stock ownership: Louise Lajoie (Merck Frosst Canada Inc.)
Employee: Louise Lajoie, Master Degree Student & Merck Frosst Employee, Senior Health Management Specialist
Commercially-sponsored research: Merck Frosst Canada Inc. (unrestricted educational research grant)

D-0847

Development of a computer-based nutrition and physical activity self-management tool for people recently diagnosed with type 2 diabetes

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Background: Didactic approaches to diabetes education have had limited success. Educational strategies that employ a skills based approach and are developed in close consultation with the target group may be more successful in improving self-management behaviours.
Aim: To develop a computer-based, interactive, nutrition and physical activity educational resource for people recently diagnosed with Type 2 diabetes.
Methods: Initially, interviews were held among health professionals (n = 7) and six small focus groups were held among the target group (people recently diagnosed with Type 2 diabetes, n = 16) to direct the content of the resource. Interviews and focus groups were transcribed and analysed using NVivo. The multimedia design team produced screen shot images which were presented to the target group and discussed in a second round of focus groups. Next, prototype versions of each individual section of the resource were developed and tested with the target group (n = 17-20 per section, 5 sections). Feedback on content, style and functionality was incorporated. Following one further round of testing (n = 10) and modification, a fully functional version was produced.
Results: Key barriers identified by the focus groups and interviews include changing habits of a lifetime, cooking or shopping to please the whole family, eating and drinking in social situations and the perception that the dietary regime is boring and unappealing. Based on these results, the research team (which had clinical, nutrition and communication expertise), together with the multimedia design team, decided on the range of interactive activities that should be included. Key activities included; recording and monitoring dietary intake with feedback and goal setting, recording and monitoring of physical activity with tailored feedback and goal setting, provision of information on a range of topics, a quiz to identify gaps in knowledge and short video clips to illustrate how other individuals who have been diagnosed with Type 2 diabetes manage their condition.
Discussion/conclusions: This interactive, computer-based resource was developed with extensive input from people with type 2 diabetes as well as experts from a variety of relevant disciplines including psychology, nutrition, and medicine. Consistent engagement with the target group and multiple stages of modification and refinement extended the duration of the development process but has created a promising education resource that is designed to promote patient education and support improved adherence to lifestyle change. The effectiveness of this tool will now be examined in a randomised controlled trial.

Conflict of interest:
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D-0848

Web-based versus face-to-face education: a longitudinal experiemental study

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Aim: This study employs a longitudinal experiment to examine the effectiveness of using the Web to deliver education to clients and to provide electronic interaction between clinicians and their clients newly diagnosed with type 2 diabetes. Participants were referred by their physicians to nurses and dietitians in a healthy lifestyle program.
Methods: Computer literate adult participants (n = 79, repeated measures) were randomly assigned for one year to one of three modes of delivery - traditional face-to-face appointments (e.g., group education sessions, paper journals and education material, virtual visits, and normal care visits), static web content (e.g., digitized education material, enhanced blood glucose log book, and normal care visits), or interactive web system (e.g., enhanced interactive electronic journal, discussion boards, chat rooms, email, virtual appointments with clinicians/coaches, and normal care visits). Group effects and gender differences were explored.
Results: Information on self-care practices and HbA1c levels was collected initially and quarterly thereafter for one year. The differences in mean changes in HbA1c between the three group are significant ($F = 4.01$, $p = 0.022$). The largest drop in HbA1c occurred in the interactive group, next in the face-to-face group, and the smallest change in the static web-based group. The gender interaction with group on the change in HbA1c is also significant ($F = 8.578$, $p = .000$). Males experience the largest drop in HbA1c in the interactive group with females showing the largest drop in HbA1c in the face-to-face group. A similar interaction effect of group and gender on self-care practices such as blood glucose testing habits was significant ($F = 10.098$, $p = .000$).
Discussion/conclusion: These findings suggest that interaction with a clinician/coach, regardless of the medium, is very important for increasing diabetes control in people newly diagnosed with type 2 diabetes. We should be careful in assuming that we can deliver only static education via the web without interaction capabilities. Furthermore, the results reveal that males perform well in an electronic interactive environment whereas females experience greater change in HbA1c values in a face-to-face interactive environment.

No conflict of interest

D-0849

Educating today's health educator: an innovative use of online technology to access, apply and grow resources

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Aims:
1. To use online technology to facilitate consistent training and certification of outpatient health educators undergoing role expansion in a large geographical area.
2. To provide health educators remote access to resources required daily to perform in their roles.

Method: The Department of Medicine within the Calgary Health Region partnered with the University of Calgary to access the online learning platform called Blackboard©. Through Blackboard©, a password protected website for hosting learning resources, exams and interactive discussion boards was developed. Learning modules included downloadable documents, website links, online articles, videos and exams with automated marking. Formal learning modules were posted under relevant navigation buttons – Diabetes, Hypertension, Lipids, Insulin Pump and Diabetes in Pregnancy. Other navigation buttons - Client Resources, Useful Stuff, Teaching Aids, Our Services - contained resources provided by educators to aid in their daily practices. These included links to community resources, self-developed documents, policies, contact numbers, graphics, regional handouts and other resources.
Results: In the past year, 12014 hits have been recorded within the content area from 130 users (not including webmaster). Approximately 67% of hits were to content within formal learning modules. Diabetes was the most visited module with almost 35% of the total hits (4160). Lipids and hypertension modules totalled approximately 24% (2856 hits). The remainder of hits were to educator submitted resources, with "Client Resources" being the most visited with over 14% of the total hits (1717). Almost 100 exams have been completed online and electronically marked since available in 2008. Discussion boards were not successful but have become an organized repository for informative emails.
Comments: As diabetes diagnoses and services increase, so does the need for maintenance of standards and competencies. Blackboard© provides one method for addressing these needs in a technological age.
Early challenges in this project included staff hesitancy to try the technology. Innovative incentives successfully enticed educators to quickly log on. Blackboard© is now accessed daily for clinical resources within learning modules and educator submitted resources. The latter include information on grocery store tours, compassionate drug supplies, smoking cessation programs, contact numbers, drug databases, rural diabetes centres and online nutrient analysis to name a few. Completion certificates are provided for completion of formal learning modules. Continued growth is expected with the addition of modules and further memberships provincially, as well as potential national partnerships.

No conflict of interest

Beta cells: from origin to dysfunction and death

D-0850

Tracing of hematopoietic lineage cells in the pancreas during ß-cell regeneration

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Regeneration of pancreatic ß-cell mass following damage is possible in the young rodent and decreases with age. However, transplantation of bone marrow-derived hematopoietic stem cells following ß-cell loss with streptozotocin (STZ) treatment in adult mice induced regeneration of ß-cell mass. Bone marrow-derived cells preferentially colonized the damaged pancreas and almost 10% demonstrated markers of endothelial precursor cells, probably differentiating into vascular endothelial cells that promoted ß-cell regeneration.
The objective was to determine the association between hematopoietic lineage cells in the neonatal mouse pancreas and the capacity for ß-cell regeneration after STZ injury. We examined the ontogeny of hematopoietic lineage cells within islets during regeneration, and the phenotype of the hematopoietic derived cells contributing to islet development.
A double transgenic mouse model *Vav-iCre;R26R-EYFP* was used where only cells derived from the hematopoietic lineage express the enhanced yellow fluorescent protein (EYFP). We induced partial ß-cell loss by *sc* injection of 35mg/kg STZ or vehicle injections (control) at postnatal days 2 and 4. Body weight and glycemia were monitored regularly. Males and females were sacrificed at days 10, 14, 21, 40 and 130, collecting blood samples and pancreas. Immunofluorescence for insulin, glucagon, EYFP, CD31, and cytokeratin 19 were performed to assess ß-cell mass, %EYFP+ve cells, and possible co-localization with endothelial and epithelial markers. EYFP+ cells infiltrated the pancreatic islets at all studied ages showing an increase in number within the islets as mice aged. Following STZ treatment ß-cell mass had decreased at d10 but no change in the number of hematopoietic derived cells was observed. At d40, an increase in EYFP+ cells was observed compared to control. Full regeneration of ß-cell mass was not reached by d130, males being more affected. Male STZ treated mice showed a decrease in hematopoietic derived cells at d130 compared to control, but females showed no change. Co-localization of insulin within hematopoietic derived cells was not evident suggesting that they did not transdifferentiate into ß-cells. The hematopoietic derived cells did not express the endothelial cell marker CD31 or the epithelial cell marker cytokeratin 19.
In conclusion, unlike other studies that have focused on transplanted hematopoietic lineage cells, we have shown that upon ß-cell damage there is an increase in the presence of endogenous hematopoietic derived cells in the islet especially at d 40 and that this corresponds to an increase in ß-cell mass. However, this regeneration is not sustained in the long-term.

No conflict of interest

D-0851

Neonatal mouse beta cells can be differentiated in vitro

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Type 1 diabetes mellitus is an autoimmune disease which destroys the insulin-producing ß-cells in the islets of Langerhans, and one treatment is islet transplantation. Despite its success, this treatment is limited by available islets from cadaver source.
Aims: We therefore seek to create insulin-producing cells for use in transplant. Our approach is to attempt islet amplification *in vitro*. Hypothetically, mature islets retain their developmental "memory", which could be induced to proliferate if shunted to the appropriate growth mode. Multiple groups have investigated ß-cell precursor differentiation to form islet-like structures by manipulating extracellular matrix selection, or combinations of growth factors, but with little consistency. Can ß-cells be induced to proliferate and subsequently differentiated? What cellular population(s) arise after long term culture? We hypothesized that the cell types contributing to the dedifferentiation and redifferentiation processes will include the ß-cell.
Methods: We have developed *in vitro* protocols for the culture of neonatal mouse islets, resulting in the reversion to an epithelial-like phenotype. Isolated islets were cultured on collagen in the presence of EGF and cholera toxin. After 4 weeks, the resultant monolayer was transferred to Matrigel-coated plates, and cultured with FGF-7 and IGF-II to induce the formation of islet-like structures. Genetic analysis by RT-PCR amplification and immunohistochemical protein assays were used to determine differentiation states. We have employed an inducible transgenic mouse strain, RIPCreER;Z/AP, that allows tagging of ß-cells with a human placental alkaline phosphatase (HPAP) reporter protein.
Results: Islets plated for dedifferentiation lost all morphological, genetic, and protein markers of mature function, including insulin and Pdx1 expression. Proliferation increased significantly. Expression of ductal markers (CK19) increased. Redifferentiation methods could not restore insulin expression, however Pdx1 was restored. Tagging of ß-cells with HPAP was accomplished in the transgenic mouse. After four weeks in culture, HPAP expression was maintained. Once replated for redifferentiation, HPAP+ cells were seen in the islet-like clusters.
Conclusions: Neonatal mouse ß-cells can be dedifferentiated *in vitro* to a proliferative phenotype under the conditions examined. While insulin expression was lost after differentiation, the ß-cell itself is involved in the redifferentiation process, as HPAP was found at all time points evaluated. Future experiments will be aimed at evaluating the staining frequency of HPAP. Methods supporting insulin reexpression are being examined. While the ß-cells are present in the resultant monolayers, are these cells truly differentiated? Co-labelling of HPAP+ cells with Ki67 and CK19 will be assessed.

No conflict of interest

D-0852

Expression and regulation of HNF1 alpha and genes related to beta cell neogenesis and metabolism by prolonged culture of newborn pancreatic islets.

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Maturity-onset diabetes of the young type 3 (MODY3) is characterized by an autosomal dominant mutation in the gene encoding hepatocyte nuclear factor 1a (HNF1a) leading to deficient insulin secretion. Several studies using HNF1a functional deletion or overexpression highlighted that this transcription factor regulates target genes related to the pancreatic b cell phenotype. However, the precise mechanisms by which HNF1a regulates gene expression are still not completely understood. Fetal and/or neonatal pancreatic islets present a low profile insulin secretory response as compared to adult islets. Prolonged culture of neonatal islets has been extensively described to improve glucose-induced insulin secretory response. In this study we investigated whether neonatal islets exposed to prolonged culture correlates improvement of secretory response with HNF1a expression and binding to promoter region of target genes. In order to achieve this goal, pancreatic islets from newborn Wistar rats were isolated by collagenase and cultured for 3 and 7 days (respectively, 3d and 7d) in RPMI 1640 supplemented with 10 mM glucose and 5% FBS. Gene expression was assessed by RT-PCR and protein content was analyzed by Western Blotting. HNF1a binding to DNA was investigated by chromatin immunoprecipitation assay (ChIP assay). Prolonged culture of neonatal pancreatic islets induced a time dependent upregulation of HNF1a. The increase of HNF1a expression was positively correlated with upregulation of b cell neogenesis-related genes Nkx6.1 and NeuroD1 whereas no differences were found in PDX1, PAX4, and PAX6 expression. We also observed that an increase in mRNA content of genes related to the mature b cell phenotype GLUT2 and insulin2 occurred in parallel to the *in vitro* upregulation of HNF1a. Additionally, we have found that, after 3d culture, pancreatic islets exhibited an increase in HNF1a binding to insulin2 and PDX1 promoters. Altogether, our results demonstrate that prolonged culture of neonatal pancreatic islets results in upregulation of HNF1a content and enhanced expression of Nkx6.1, NeuroD1, GLUT2 and insulin2. The present data suggest that increase of HNF1a during the *in vitro* maturation of neonatal pancreatic islets might not exclusively account for the establishment of the b cell phenotype since its binding to PDX1 promoter does not correlate with increased PDX1 transcription. However, HNF1a is likely to play an important role in this process as it apparently upregulates insulin2 throughout neonatal pancreatic islet maturation.

No conflict of interest

D-0853

Gene expression changes during beta cell regeneration in offspring of female mice exposed to a low protein diet

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We previously demonstrated the ability of young female mice to replace beta cells after multiple low dose streptozotocin (STZ) treatment. Regeneration of beta cells was complete by day 30, but glucose intolerance was observed at day 42, with beta cell mass deteriorating by day 130. We have also shown that protein restriction (low protein-LP diet) during fetal life leads to the development of glucose intolerance in adulthood. Furthermore, offspring of LP-fed dams treated with STZ were unable to replace beta cell mass.
Our current objective was to identify genes differentially expressed in offspring from LP vs control-fed animals and during ß-cell regeneration after STZ treatment.
Pregnant Balb/c mice were placed on a control (C) (20% protein) or an isocaloric LP (8% protein) diet throughout gestation. All dams were placed on the C diet at birth. Female offspring were injected i.p. with 35 mg/kg STZ or vehicle at birth on days 1 to 5 for each dietary treatment. On day 30, the mice were sacrificed and the pancreas was removed and snap frozen in liquid nitrogen. Total RNA was extracted (for n=3/group), purified and then hybridized to an Affymetrix Mouse Genome 430 2.0 GeneChip to determine gene expression profiles. Results were analyzed using GeneSpring v7.2 and classified based on Gene Ontology (GO).
In C+STZ mice, we found 137 genes were decreased by >1.5 fold compared to control, 22 of which were classified as involved in cell cycle and cell proliferation. Genes involved in insulin signaling and glucose homeostasis were downregulated including insulin I, insulin II, glucagon, glut2 transporter, and glucose-6-phosphatase (Table 1). In the LP and LP+STZ mice, 426 and 845 genes, respectively, were decrease by >1.5 fold compared to controls. Both these groups had decreased expression of insulin signaling and glucose homeostasis genes, with a greater affect in the LP+STZ group (Table 1). The effect of LP exposure was evident by the downregulation of genes related to translation, ribosome biogenesis, protein folding, electron transport, cell redox homeostasis, cell cycle and cell proliferation. In the LP+STZ mice, the number of downregulated genes was further increased, suggesting a more detrimental effect, resulting in beta cell failure.
While beta cells have regenerated by Day 30 in C+STZ mice, genes critical for glucose homeostasis have been downregulated, a precursor to the glucose intolerance previously observed by day 42. Failure of beta cell regeneration in LP+STZ mice is consistent with extensive gene downregulation involving cell proliferation, function and survival.

Table: Fold decrease in gene expression compared to controls.

Gene	C+STZ	LP	LP+STZ
Insulin I	5.0	2.4	4.0
Insulin II	3.3	2.1	3.5
Glucagon	1.8	3.0	2.1
Glut2	1.9	3.7	1.9
Glucose-6-Phosphatase	5.3	3.7	3.9
Islet Amyloid Polypeptide	5.3	3.4	4.3

No conflict of interest

D-0854

Effect of inducible nitric oxide synthase (iNOS) gene silencing on islet cell apoptosis in early islet graft

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Aims: Pancreatic islet transplantation is a promising therapeutic intervention for type 1 diabetes mellitus. One of the significant obstacles to successful islet transplantation is a high number of cell deaths in islet grafts during the first few days after implantation, mostly from inflammatory and hypoxic damage. To overcome these obstacles and improve the outcome of islet transplantation, genetic modification of islets has been attempted. The expression of iNOS has been shown to increase in the initial days after islet transplantation and is thought to mediate graft inflammation and hypoxic islet damage in early islet transplantation. Therefore, we investigated the effect of iNOS gene silencing on islet cell apoptosis in early islet graft.
Methods: Rat insulinoma INS-1 cells or isolated rat islets were transfected with chemically synthesized small interfering RNAs (siRNAs) for iNOS or negative control-siRNA complexed with Lipofectamine. iNOS gene expression was assessed at mRNA level by real time RT-PCR. The effect of gene silencing was also assessed with inflammatory cytokine-induced NO production (Griess reaction) and apoptosis (AV-PI flowcytometry). Five hundred rat islets transfected with iNOS-siRNA or negative control-siRNA were transplanted syngeneically under the kidney capsule. Grafts were harvested 3 or 5 days after transplantation, and the apoptosis of islet graft was determined by TUNEL assay.
Results: Transfection of INS-1 cells with siRNA for iNOS silenced iNOS gene expression by >60%. Gene silencing of iNOS significantly prevented INS-1 cells or rat islet cells from cytokine-induced NO production. In addition, cytokine-induced apoptosis in transfected INS-1 cells was markedly decreased. Compared with negative control-siRNA transfected islet grafts, apoptotic cells were significantly less in iNOS-siRNA transfected islet grafts, on 3 or 5 days after transplantation.
Conclusion: Our data suggest that iNOS plays an important role in the early islet cell death after islet transplantation, and ex vivo iNOS gene silencing with nonviral carrier could be a feasible approach to prevent islet cell apoptosis in the initial days after islet transplantation and improve the outcome of islet transplantation.

No conflict of interest

D-0855

Autophagy protects against cell death induced by human islet amyloid polypeptide

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Background and aims: Human islet amyloid polypeptide (hIAPP), or amylin, is the amyloid-fibril-forming polypeptide in the islet of type 2 diabetes, differently from rat IAPP (rIAPP) which has no amyloid-forming property. It was reported that in COS-1 cells expression of endogenous hIAPP leads to amyloid genesis and induction of cell death in human islet beta cells. We also reported that expression of hIAPP induced intracellular amyloidogenesis and apoptosis in vitro. However, the molecular mechanisms by which hIAPP mediates cell death have not been identified. Autophagy is a major pathway for degrading aggregated proteins and damaged organelles. Although autophagy is implicated in various diseases including neurodegenerative disease, its role in cell death associated with hIAPP has not been examined. We thus performed the in vitro experiments using COS-1 cells to determine whether cell death mediated by hIAPP could be related to autophagy.
Materials and methods: COS-1 cells were transfected with hIAPP or rIAPP gene. The viability of the cells was evaluated by modified MTT assay at 48, 72, 96 and 120 hours after transfection. The cells were examined with electron micrography at 48 hours after transfection. We analyzed the conversion from microtubule-associated protein 1 (MAP-1) light chain 3 -I (LC3-I) to LC3-II by western blot using the cell lysates. The viability of the cells and the conversion of LC3 were also examined after treatments with autophagy inducer or inhibitor.
Results: The viability of the cells transfected with hIAPP was significantly decreased compared with rIAPP at 96 and 120 hours after transfection ($P < 0.01$). Electron micrography indicated the formations of autophagosomes and autolysosomes in the cells transfected with hIAPP. The conversion from LC3-I to LC3-II was also detected, under conditions representing autophagosomes. In the experiments using inducer or inhibitor of autophagy, the viability of the cells transfected with hIAPP was assessed using correction by rIAPP. When the autophagy was suppressed by 3-methyladenine (3-MA: 0.5mM), an inhibitor of autophagy, the viability of the cells transfected with hIAPP was decreased. On the other hand, the rapamycin (100nM), an inducer of autophagy, increased the viability of the cells transfected with hIAPP.
Conclusions: Autophagy plays a protective role against cell death induced by hIAPP expression *in vitro*.

No conflict of interest

D-0856

XOMA 052, a potential disease-modifying anti-interleukin-1 beta (IL-1 beta) regulatory antibody, shows reductions in hs-CRP, HbA1c and FPG after subcutaneous injection in a randomized, blinded, placebo-controlled trial in subjects with type 2 diabetes mellitus

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Background: XOMA 052 is a potent anti-inflammatory antibody that binds human IL-1 beta with a very high affinity (300 fM) and may regulate the inflammatory component of type 2 diabetes mellitus (T2D) responsible for reduced pancreatic beta cell function and decreased insulin sensitivity, with the potential to delay the progression of T2D and simplify disease management. Chronically elevated glucose creates a locally toxic state in the pancreas causing production of excess IL-1 beta, leading to macrophage infiltration and beta cell dysfunction. XOMA 052 has a novel molecular mechanism of action that permits regulated attenuation rather than complete blockade of the IL-1 pathway, and in preclinical models improves glucose control, beta cell function and mass, and insulin resistance. Prior interim clinical data from part 1 of this study showed that XOMA 052 administered as a single intravenous (IV) dose reduced hs-CRP and HbA1c and increased insulin production.
Aims and methods: A randomized, 3-part, blinded, placebo-controlled study of escalating doses of XOMA 052 in subjects with inadequately controlled T2D. In parts 2 and 3, separate groups of subjects received single subcutaneous (SC) doses of 0.03, 0.1, or 0.3 mg/kg, or three SC doses given every other week of 0.03 or 0.3 mg/kg. In each group, five subjects received XOMA 052 and one subject received placebo; subjects were followed 56 to 84 days. The aims were to evaluate the safety and pharmacokinetics of XOMA 052 in subjects with T2D. Additional assessments were performed as exploratory measures of biologic and clinical activity.
Results: XOMA 052 was well-tolerated with no evidence of serious drug-related adverse events to date. The beta half-life for both SC and IV administration was 22 days, with no apparent difference in clearance between the routes of administration. Mean SC bioavailability across all doses was 60%, with individual estimates between 30 and 90%. After 14 days, a single dose of XOMA 052 reduced hs-CRP by a median of 52% (range of 25 to 79%) among all treated groups vs. a median increase of 8% for placebo. XOMA 052 changed HbA1c by a median of -0.1% (range of -2.2 to +0.7%) at 42 days vs. placebo with a median of +0.3%. XOMA 052 also reduced FPG by a median of 10% (20 mg/dL) at 42 days compared to 2% (7 mg/dL) for placebo.
Conclusions: The data from the single dose SC part of this study with the anti-IL-1 beta antibody, XOMA 052, confirms and builds upon the prior IV data and supports a potentially new disease modifying approach to T2D by a novel antibody therapeutic. Based on these promising results, future phase 2 testing with monthly or less frequent dosing is planned.

Conflict of interest:
Employee: J.D. Feldstein, P.R. Urquilla, K. Der, H. Zayed, S. Guzy, A.F. Maurer, J. Whitmore, R.K. Hansen, P.J. Scannon - XOMA (US) LLC, Clinical and Preclinical Development, Berkeley, CA, USA

D-0857

Long-term high fat and sucrose feeding of wistar rats induces early diabetic changes in a non-genetic predisposed wistar rat model

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Introduction: Long-term high fat feeding of rats not predisposed to developing diabetes induces obesity and insulin resistance without the development of overt signs of diabetes. The addition of simple sugars to high fat feeding exacerbates insulin resistance and results in T2D.
Aims: This study aims to determine how the addition of sucrose to a high fat diet affects the glucose metabolism and islet morphology.
Materials and methods: Wistar rats were randomized into the following three experimental groups (n=6 per group): a high fat diet group (HFD) receiving a diet containing 40 % energy as fat, 15% protein, 45% carbohydrates; a café diet group receiving the high fat diet with the addition of 15% sucrose in their drinking water and a control group receiving standard rat chow (10 % energy as fat, 15% protein, 75% carbohydrates). The different diets were given from weaning up to 12 months.
Results: After 12 months the body mass of the rats receiving HFD and the café diet were significantly higher than the controls (908.6 ± 131.1g and 947.2 ± 51.5g vs. 599.07 ± 35.7g; p=<0.0001). Fasting blood glucose values were significantly increased in the café diet group compared against both the HFD group and the control group (7.14 ± 1.5mmol/l vs. 6.05 ± 1.1mmol/l; p=0.03 and 5.7 ± 0.8mmol/l; p=0.006). IVGTT AUC values were significantly increased in the café diet compared to both HFD and the controls (850 ± 71.7 vs. 596.1 ± 53.1; p=0.001 and 526.4 ± 128.7l; p=0.001). Fasting insulin levels were significantly lower in the HFD group vs. the café diet and control groups (4.4 ± 2.9 ng/ml vs. 11.6 ± 6.1 ng/ml; p=0.0003 and 8.5 ± 5.3 ng/ml; p=0.01). The intravenous glucose stimulated insulin secretion rate AUC values were significantly decreased in the café diet group versus the controls (175.4 ± 135.7vs. 495.2 ± 236; p=0.03). Insulin resistance as determined by the HOMA-IR model was significantly increased in the café diet group vs. the controls and the HFD group (3.7 ± 2.0 vs. 2.1 ± 1.3 and 1.3 ± 1.1; p=<0.0008).
Morphologically there was a significant increase in the occurrence of large hypertrophied irregular islets with amyloid deposits and fibrous changes in both the HFD and café diet groups. These morphological changes were limited to the large islets while the smaller islets appeared normal.
Conclusion: These results showed that maintaining Wistar rats on a HFD from weaning for 12 months induced obesity without significantly decreasing insulin sensitivity. When sucrose is added to the HFD, insulin resistance is worsened and early signs of T2D appear. Morphologically however, type 2 diabetic changes to the pancreatic islets were already present in the high fat diet groups.

No conflict of interest

HEALTHCARE AND EPIDEMIOLOGY

Cardiometabolic risk

D-0858

Is an 8 hour fasting status to assess blood glucose as a risk factor in epidemiological studies mandatory ? Impact of time since last caloric intake on blood glucose concentrations in individuals with and without diabetes mellitus

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Aims: Blood glucose concentrations (BG) are usually measured after a certain period of fasting. Evidence-based recommendations for the definition of a fasting status are missing, and only by convention a caloric restriction for =8 hours is the most commonly used implementation. In epidemiological studies the need for fasting complicates logistics and in general it is not feasible to reliably control for fasting status. Here we analyzed the BG distribution with regard to the last caloric intake in order to determine the minimal duration where non-fasting and fasting BG do not differ.
Methods: In October 2005 we enrolled 35,869 participants (age range 18-99) in randomly selected general practices. Blood samples were analyzed in a central laboratory. The time of the last caloric intake was assessed by asking participants for time and type of the last meal or drink before blood withdrawal. We stratified the sample according to Diabetes mellitus (DM) status, defined as physicians' diagnosis or participants' self-report of DM or use of anti-diabetic medication. We used generalized linear models to assess the effect of time since last caloric intake adjusting for age and other factors (time of blood withdrawal, BMI, smoking status, physical activity, hypertension, alcohol use). Age-adjusted mean change from fasting BG and 95% confidence limits (95%-CI) were calculated.
Results: We included n=29,221 participants with data for outcome, exposure and age. Mean random BG was 90.8±17.9mg/dL in individuals without and 143.8±57.4mg/dL in individuals with DM (n=3,686). Highest BG in individuals without DM was measured in the first hour after caloric intake with an age-adjusted mean change from fasting BG (≥8hours) of 4.9mg/dL (SE±0.8). Already after 3 hours the mean BG did not differ any more from the mean BG of individuals with fasting status. The analysis of covariance revealed in men an age-adjusted decline of BG according to the time of last caloric intake of <1h: 6.7mg/dL (95%-CI: 3.5;9.9) and 3h:-1.5mg/dL (-2.7;-0.3), women <1h: 4.5mg/dL (2.7;6.3), 3h:-1.3mg/dL (-2.1;-0.6). In individuals with DM this time dependence was more distinctive, i.e. men 1h: 26.8mg/dL (18.9;34.7), 3h: 13.1mg/dL (5.6;20.6), 4-5h:-3,9 mg/dL (-13.0;5.2) women 1h: 20.3mg/dL (12.1;28.5), 3h: -3.9mg/dL (-11.7;3.9), 4-5h: -10.6mg/dL (-19.8;-1.5). Considering influencing factors did not essentially change the results.

Discussion/conclusion: Our results suggest that blood glucose concentrations in individuals without diabetes mellitus measured 3 hours after caloric intake may already yield valuable results. We suggest reconsidering a fasting status of >8hours when measuring BG as risk factor in epidemiological studies.

No conflict of interest

D-0859

Strength of cross-sectional relationship of abdominal obesity with diabetes and hypertension varies according to gender and age: results from IDEA Argentina

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Background: It is well-known that abdominal obesity is related with diabetes and hypertension. We aim to quantify the strength of this association, according to gender and age,
Material and methods: IDEA (International Day for the Evaluation of Abdominal Obesity) was an international cross–sectional study that recruited 168,159 consecutive patients aged 18 to 80 years who attended the offices of randomly chosen primary care physicians on two pre-specified half days in 2005. IDEA included consecutive patients from rural and urban general practitioners in all geographic areas of all participating 63 countries, giving a representative sample of the patients attending primary care consultations. The present analysis compares, in the 2958 patients with complete data included in the IDEA study in Argentina, the association of abdominal obesity (IDF criteria, waist $\geq$ 94 cm men; $\geq$ 80 cm women) with prevalent diabetes and hypertension in women (n=1862) and men (n=1096), and in different age groups: < 50 years (n=1120), 50 -60 years (n=611), 60-70 years (n=603), > 70 years (n=624).
Results: In both genders, abdominal obesity was related with diabetes and hypertension, with a clear trend to stronger association in women: OR (CI 95%) for diabetes in women 6.1 (3.0 – 14.6), in men 2.9 (1.7 – 4.9); OR (CI 95%) for hypertension in women 5.2 (3.9 – 7.2), in men 3.3 (2.4 – 4.4). The association of abdominal obesity with both diabetes and hypertension attenuates as age advances, becoming statistically non significant in the oldest group: a) OR (CI 95%) for diabetes in < 50 years 3.0 (1.2 – 5.0), 50 - 60 years 3.0 (1.3 – 8.7), 60 - 70 years 2.2 (1.02 – 5.5), > 70 years 2.0 (0.9 – 4.9); b) OR (CI 95%) for hypertension in < 50 years 5.4 (3.3 – 9.0), 50 - 60 years 3.8 (2.3 – 6.5), 60 - 70 years 2.0 (1.3 – 3.3), > 70 years 1.3 (0.7 – 3.1).
Conclusions: The cross-sectional association of abdominal obesity with diabetes and hypertension seems to be stronger in women and in younger people. From an epidemiological and a clinical perspective, these data are useful to target efforts against abdominal obesity in those people most vulnerable to its negative cardiometabolic effects.

Conflict of interest:
Employee: Hernandez Moran Paula

D-0860

The applicability of the Hypertriglyceridemic Waist Syndrome to Non-Hispanic Blacks: analyses of NHANES 1999-2004

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The Hypertriglyceridemic Waist (HTGW) Syndrome was designed to predict cardiovascular disease risk in non-Hispanic whites (NHW). It has two requirements: hypertriglyceridemia defined as triglyceride levels (TG) $\geq$177 mg/dL and elevated waist circumference (WC) (Men$\geq$90 cm; Women$\geq$85 cm). However, non-Hispanic blacks (NHB) often have lower TG levels despite a higher rate of cardiovascular disease than NHW and Mexican Americans (MA). Therefore, the validity of HTGW Syndrome in NHB is uncertain. Our goal was to compare TG levels, WC and the prevalence of HTGW Syndrome in NHB, NHW and MA in 3749 non-diabetic adults from NHANES 1999 to 2004, age$\geq$20y (mean 43y). Mean (SE) TG levels in NHB, NHW and MA were 99(3), 130(2) and 135(4) respectively (P<0.001 NHB vs. NHW or MA). The percent of subjects with TG$\geq$177 mg/dL was lower in NHB than NHW or MA (both P<0.001) (Table). Mean (SE) WC levels in NHB, NHW, and MA men were 93(0.9), 99(0.5), and 96 (0.9), respectively. For women, the mean WC levels for NHB, NHW, and MA were 97 (1), 90 (0.6), and 94 (0.9), respectively. WC and percent of subjects with increased WC was not significantly different between NHB, NHW and MA. However, the prevalence of HTGW Syndrome was much lower in NHB than NHW or MA (P<0.001 NHB vs. NHW or MA) (Table). Although NHB have more cardiovascular disease than NHW or MA, NHB have a lower prevalence of HTGW Syndrome. This paradox can be attributed to low TG levels in NHB. Hence, the value of HTGW Syndrome in NHB requires confirmation.

Table: Characteristics by Ethnicity

	NHB	NHW	MA	*P*-value
%TG$\geq$177	8.8(1.4)	20.8(1.1)	22.0 (1.5)	a***, b***
%WC Elevated	65.4(1.8)	67.3(1.3)	70.5(2.4)	NS
% HTGW Syndrome	7.6 (1.4)	18.4 (1.0)	20.9 (1.4)	a***, b***

[a] NHB vs. NHW, [b] NHB vs. MA, [c] NHW vs. MA
P*$\leq$0.05, P**$\leq$0.01, P***$\leq$0.001

No conflict of interest

D-0861

Metabolic syndrome in Cameroon - comparison and concordance of two definitions

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Aims: This study was performed to determine the concordance of metabolic syndrome (MetS) prevalence according to International Diabetes Federation (IDF) 2005 and National Cholesterol Education Program Adult Treatment Panel III (NCEP/ATP III) 2001 definitions in a Cameroonian population and to determine the most accurate definition.
Methods: Among the 1949 participants received during the study in Yaoundé (the capital city of Cameroon and a cosmopolitan town), based on the WHO 1998 classification of obesity, a total of 1520 overweight or obese adults aged ≥18 years (1193 women and 327 men) were selected for the biochemical tests. Blood samples were analyzed, blood pressure and waist circumference assessed, data on lifestyle, medication, chronic disorders, and socio-demographic characteristics collected. Kappa test was done to examine the agreement between the definitions.
Results: The mean age of the group was 34.87 ± 10.97 years for men and for women 36.9 ± 11.28 years. The prevalence of MetS using NCEP/ATP III and IDF definitions was 13.0% and 19.5% respectively. The agreement rate between the IDF and NCEP/ATP III was good (Kappa = 0.72). The subjects defined only with NCEP/ATP III and not IDF were all women. They had lower body mass indices, waist circumferences but higher triglyceride levels than those defined by both NCEP/ATP III and IDF.
Discussion/conclusion: The agreement between ATPIII and IDF definitions was very good, especially in women. In addition, the IDF definition of MetS, with the absence of central obesity criteria in the African population is not accurate for the detection of Mets prevalence in Cameroon. Further studies on MetS in African populations should be done with NCEP while awaiting recommended values for waist circumference in Africa. MetS in Cameroon requires the execution of urgent preventive measures, especially promotion of healthy life style.

No conflict of interest

D-0862

Ferritin concentrations, type 2 diabetes, metabolic syndrome and insulin resistance in a Chinese population

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Aims: we examined the association among serum ferritin concentrations, DM, metabolic syndrome(MS) and insulin resistance in a Chinese population in Sichuan province.
Methods: We conducted a cross-sectional study in 3040 subjects from three communities in Sichuan. Serum ferritin concentrations, glucose tolerance status, plasma lipids, alanine aminotransferase, aspartate aminotransferase, uric acid and creatinine were determined in all subjects. Blood pressure, BMI and waist circumferences were also measured. Metabolic syndrome was diagnosed using the IDF criteria.
Results: Individuals with newly diagnosed DM, previously diagnosed DM and prediabetes had elevated serum ferritin concentrations compared with those of normal glucose tolerance (191.13±114.96µg/l vs. 184.63±109.51µg/l vs.

164.77±116.25µg/l vs. 119.58±97.57µg/l, P<0.05). After adjusting for age, race, BMI, smoking, alcohol consumption, activity, family history, education, residential district, waist circumferences, WHR, blood pressure, plasma lipids and uric acids, the odds ratio of prediabetes and DM was 1.54 (95% CI: 1.08-2.19) in men with ferritin concentrations ≥300µg/l and was 1.80 (95% CI: 1.36-2.39) in women with ferritin concentrations ≥150µg/l, respectively. the odds ratio of prediabetes and DM was 1.46 (95% CI 1.05-2.03) in men with ferritin concentrations in the highest quartile (=271.1µg), and 1.76 (95% CI 1.34-2.33) in women with elevated ferritin concentrations(=141.5µg).
The prevalence of MS in subjects with serum ferritin concentrations in the highest quartile was significantly higher than those in the lowest quartile, either in men (32.2% vs 10.1%, P<0.001) or women (38.8% vs 10.7%, P<0.001). After adjusting for age, race, BMI, smoking, alcohol consumption, activity, family history, education and residential district, the odds ratios of MS in subjects with serum ferrtin concentrations in the highest quartile were 1.71 (95% CI 0.92-3.19) in men and 1.67 (95% CI 1.03-2.70) in women when compared with those in the lowest quartile. In all subjects, the serum ferritin concentrations increased gradually with increasing numbers of co-existing metabolic components accordingly (P<0.001). This positive relationship between the numbers of co-existing metabolic components and serum ferritin concentrations remained significant when male and female subjects were analyzed separately (P<0.001).
A positive association was found between serum ferritin concentrations and HOMA-IR. HOMA-IR (=1.98) was associated with a higher level of ferritin and uric acid.
Conclusion: Serum ferritin concentrations increased remarkably in DM patients, and elevated serum ferritin concentrations were associated with an increased risk of prediabetes and DM. Furthermore, we found a positive association between serum ferritin concentrations and MS. Also elevated level of ferritin was positively associated with insulin resistance.

No conflict of interest

D-0863

Body mass index, triceps skinfold and waist circumference in screening for adiposity and risk of metabolic syndrome in Romanian rural children aged 3-11 years

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Objective: Childhood obesity has been rapidly increasing in both developed and developing countries. Considering the lack of reference values in Romania, we determined the prevalence of overweight and risk of metabolic syndrome using the body composition characteristics, weight, body mass index (BMI), triceps skinfold (TSF), and waist circumference (WC) in rural preschool and primary school children in Miroslava, Romania.
Methods: The present study is based on cross-sectional data of 210 children (106 boys and 104 girls) aged 3–11 years measured in 2008. Participants were recruited from schools in Miroslava, eastern Romania.
Results: Overall, 15.1% of the boys and 21.1% of the girls were above the 90th weight-for-height percentile. Using international cut-off values for body mass index, the overall prevalence of overweight and obesity was 14.2% (above 85th percentile) and 5.7% in boys (above 95th percentile), and 22.1% (above 85th percentile) and 10.6% (above 95th percentile) in girls. The excess of fat was measured by triceps skinfold, 14.2% of the boys and 23.1% of the girls being above the 95th triceps skinfold for age percentile. The prevalence of metabolic syndrome using WC values above 90th for age percentile was 4.7% in boys and 4.8% in girls. For both sexes a highly positive correlation was found between waist circumference and BMI, skinfold thicknesses, and percentage of body fat.
Conclusions: Our study supports high frequencies of childhood overweight and obesity in developing countries. A substantial number of overweight 3- to 11-year-olds have abnormal abdominal obesity, indicating that overweight in early adolescence may put children at risk for adult-onset cardiovascular disease and/or type 2 diabetes well before they become teenagers.

No conflict of interest

D-0864

The cutoff level of waist circumference for predicting the presence of multiple risk factors for cardiovascular disease in the Vietnamese population

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Aims: Metabolic syndrome is characterized by a cluster of risk factors for cardiovascular disease (CVD). Waist circumference is the easiest measure of central obesity, and it has been recommended that ethnic group-specific cutoffs for waist circumference should be used to link subjects to CVD risk. Therefore, we analyzed surveillance data to determine the most suitable cutoff level of waist circumference for the diagnosis of metabolic syndrome in the Vietnamese population.
Methods: We recruited 1516 participants in this cross-sectional study conducted in Hanoi, Vietnam, in 2009. Among them, 1459 subjects (483 men and 976 women) between 25 to 96 years of age completed the measurements of all the items of the metabolic syndrome; these subjects were included in the analyses. The waist circumference was measured twice at the midpoint between the lowest rib and the iliac crest, and its mean value was used in the analysis. The following 4 risk factors were defined by the criteria of the National Cholesterol Education Program's Adult Treatment Panel III (NCEP-ATP III): (1) triglycerides, ≥150 mg/dl; (2) high-density lipoprotein cholesterol, <40 mg/dl in men and <50 mg/dl in women; (3) systolic blood pressure, ≥130 mmHg, or diastolic blood pressure, ≥85 mmHg; and (4) fasting plasma glucose, ≥110 mg/dl. Subjects with 2 or more of the abovementioned 4 risk factors were defined as having multiple risk factors. Subjects with a history of or those undergoing medical treatment for hyperlipidemia, hypertension, or diabetes were deemed as having each risk factor, regardless of their biochemical values. The optimal cutoff value of waist circumference for the definition of central obesity was assessed by ROC curve to predict the presence or absence of 2 or more risk factors of the metabolic syndrome other than the waist circumference.
Results: The mean age (SD) of the study subjects was 55.9 (14.6) years for men and 53.5 (13.0) years for women. Multiple risk factors were prevalent in 52.6% of the men and 46.8% of the women in the study, respectively. The optimal cutoff point of waist circumference yielding the maximal sensitivity plus specificity was 82 cm in men and 72 cm in women. A cutoff waist circumference of 76 cm in men and 73 cm in women yielded at least 80% sensitivity for predicting the presence of multiple risk factors.
Discussion/conclusion: The cutoff point of waist circumference yielding the maximal sensitivity plus specificity for predicting the presence of multiple risk factors for CVD was lower in the Vietnamese population as compared to that in the Japanese population. Therefore, this study clarifies the need of investigating this cutoff point for specific ethnic groups.

No conflict of interest

D-0865

The hypertriglyceridemic waist syndrome does not predict the metabolic triad in blacks

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Metabolic Triad predicts premature coronary artery disease (CAD). The criteria for the Metabolic Triad are: hyperinsulinemia, hyperapolipoprotein B (apoB) and small dense low density lipoprotein (LDL) particles. In whites, Hypertriglyceridemic Waist (HTGW) Syndrome predicts the Metabolic Triad. To diagnose HTGW Syndrome, both waist circumference (WC) (Men≥90cm; Women≥85cm) and triglyceride (TG) concentration (≥177mg/dL) must be elevated. As blacks have more obesity but lower TG levels than whites, the ability of the HTGW Syndrome to predict the Metabolic Triad must be verified in blacks. Our goal was to compare the prevalence of HTGW Syndrome and Metabolic Triad in blacks. All 190 blacks (48% Male, Age 35±8y, (mean±SD), BMI 30.2±7.4, 18.5-54.7kg/m^2) had WC, TG, insulin, apoB and LDL size determined. Prevalence of HTGW Syndrome and the Metabolic Triad were

compared in overweight and glucose intolerant blacks. Both groups are at high risk for premature CAD. For overweight blacks, 85% had increased WC but only 3% had TG≥177mg/dL. HTGW Syndrome occurred in just 3% of overweight subjects; yet 52% had the Metabolic Triad. For glucose intolerant blacks, 91% had increased WC but only 7% had TG≥177mg/dL. HTGW Syndrome occurred in 7% of glucose intolerant blacks, but 52% had Metabolic Triad. Median TG levels in blacks with Metabolic Triad are provided in the Table. In conclusion, the low prevalence of HTGW Syndrome in blacks is due to the relative absence of hypertriglyceridemia. As the Metabolic Triad in blacks is approximately 10 times more common than HTGW Syndrome, HTGW Syndrome should not be used to predict the Metabolic Triad.

Table: Subject Characteristics

Category	Increased WC (%)	TG≥177 mg/dL (%)	HTGW Syndrome (%)	Metabolic Triad (%)	Metabolic Triad Median TG (mg/dL)
Overweight	85	3	3	52	83
Glucose Intolerant	91	7	7	52	104

No conflict of interest

LIVING WITH DIABETES

Preventing the development of diabetes

D-0866

Development and Implementation of a European Guideline and Training Standards for Diabetes Prevention - The IMAGE project: a report of the IMAGE Study Group on the current status and perspectives

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Background: The dramatic increase of type 2 diabetes has become a serious burden for European health care systems. Clinical studies clearly demonstrated that prevention programs can significantly reduce the risk of developing diabetes. At the political level there is a clear consensus that immediate strategic action is needed to counter the diabetes epidemic. A variety of national prevention management concepts do exist which can be implemented into clinical practice. In view of the still lacking EU-wide strategies, the IMAGE Project was submitted to the European Commission under the call for proposals 2006 for the program of community action in the field of public health (2003-2008). With over 40 partner organizations from 16 EU- and 6 non-EU member states it is one of the largest projects in the public health sector recommended for co-funding.
Objectives: Effective primary prevention is the key to reducing the epidemic in type 2 diabetes. The IMAGE project will help to address this through the development of four specific objectives:
1. European practice-oriented guidelines for the primary prevention of type 2 diabetes
2. A European curriculum for the training of prevention managers
3. European standards for quality control
4. A European e-health training portal for prevention managers

Current status: The project duration is three years (06/2007 – 05/2010). In the second quarter of 2009 the guideline will be finalized and reviewed by external experts. Also the other tools developed in the first project half (curriculum, quality management system, e-health portal) will be tested in 2009 in a pilot phase with about 100 participants all over Europe. From October 29-31 2009 the IMAGE study group will meet for the final convention in Lisbon, Portugal, to present and discuss the outcomes.
Perspectives: The final results will be presented at the 6th World Congress on the Prevention of Diabetes and its Complications in Dresden, Germany on April 8-11, 2010.
The implementation of IMAGE results will provide unique European-wide guidance for the first time in a new evolving field of health care. Particularly implementing the guideline and quality standards so that they are in everyday use will be a great merit of the EU commission and the IMAGE consortium also beyond the official project duration.

No conflict of interest

D-0867

Large-scale implementation of diabetes prevention programs: an Australian experience

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Aims: This paper describes the process of translating the results of clinical trials in the prevention of diabetes to large-scale implementation in Australian primary care.
Methods: In 2004-2006 we conducted a national demonstrator diabetes prevention program in Australia based on the Finnish clinical trials starting with intensive individual interventions and moving to structured group programs. Our six-session group diabetes prevention program focusing on lifestyle change was selected by the Victorian government targeting 25,000 high-risk individuals over the age of 50 years. It is called *Life! Taking action on diabetes*.
Results: We present the pragmatic aspects of this large-scale intervention including the balance between fidelity and adaptation for systematic application of the Health Action Process Approach behaviour change theory; standardization of the intervention and training of 160 group facilitators; recruitment strategies including social marketing; engagement of stakeholders including primary care practitioners; performance measurement; and continuous quality improvement. Early results suggest that the effects the *Life!* program are comparable with other studies.
Discussion/conclusion: Implementation on a scale that requires 25,000 participants is complex. Many lessons have been learned which may benefit future diabetes prevention programs. An analysis of the successes and lessons learned for widespread implementation will be presented. A benefit of the diabetes prevention program recruitment process was the greater awareness of diabetes in the community and diagnosis of pre-existing diabetes, but recruitment required greater planning, effort, and time to create groups than anticipated. Another benefit is the contribution of the program to a skilled healthcare workforce that can conduct cost-effective group interventions for a great and growing health problem.

No conflict of interest

D-0868

Primary prevention program in Pakistan; impact of intervention on the prevention of type 2 DM

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Aims: South Asians have higher cardio-metabolic risk factors and often present at younger ages with diabetes than other populations. Since prevention is a cost effective way to reduce the burden of diabetes, and studies on primary prevention in South Asians are very limited, the objective of this study was to prevent the development of type 2 diabetes in persons with impaired glucose tolerance (IGT).
Methods: A joint collaborative study was initiated in 2007 between University of Oslo, Diabetic Association of Pakistan and Baqai Institute of Diabetology and Endocrinology for a period of three years. Total 1,825 high risk subjects aged > 30 yrs were screened by oral glucose tolerance test (OGTT) for abnormal glucose tolerance. Demographic and socioeconomic information was collected through a structured questionnaire. Subjects identified as having IGT were invited to participate in the intervention program for a period of 18 months.
We developed an intervention team comprising of one project coordinator, one

medical officer, two dieticians and two physical therapists to supervise and guide the subjects during the study about lifestyle modifications.
We are following these subjects for 18 months and have OGTT, fasting lipid profile, fasting insulin and HbA1c done at 0, 9 and 18 months. Also a FFQ diet assessment plan was filled on 0, 9 and 18 months by the dieticians.
Results: Out of 1,825 subjects, 195 (10.7%) subjects were newly diagnosed type 2 diabetes while 400(22%) subjects had IGT. Majority (72%) of the study subjects were males. Overall mean age of the subjects was 41.5 years while mean ages of normal, impaired and diabetic subjects was 40.2, 43.8 and 44.6 years respectively.
The subjects were initially divided into standard (n=178) and intensive (n=222) lifestyle modification groups. Metformin was the drug option given to half of the subjects in both the groups. Since some subjects refused to take the drug we had uneven number of subjects in the final four groups. Thus we had 107 subjects in the standard group while 71 subjects in the drug group. Similarly we had 142 subjects in the intensive group while 80 subjects in the intensive + drug group.
So far 252 subjects have completed the study and of these 29 have become diabetic while 150 have reverted back to normal glucose tolerance. The final subject would be assessed by May 2009 and we hope to present the final results in October at the IDF conference.
Conclusion: Preliminary data show that 6.6% of subjects in intensive group developed diabetes compared to 10.8% of standard group. Final assessment would be done after completion of study in May.

No conflict of interest

D-0869

Japan diabetes outcome intervention trial-1 (J-DOIT1), a nationwide type 2 diabetes prevention trial: study design and results of recruiting

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Background: In Japan, the number of patients with type 2 diabetes (T2DM) is rapidly increasing and medical expenditure for T2DM is crucial. Previous studies showed that overweight people can prevent or delay the initiation of T2DM by achieving the weight loss through the lifestyle modification. However, previous intervention programs were relatively intense, needed large skilled human resources and cost a great deal. Therefore, we launched a nationwide trial to evaluate if the program dealing with more participants with lower cost and lighter workload is also effective for T2DM prevention.
Methods: The study design is a cluster randomized intervention trial. High-risk people for T2DM are recruited on the basis of results of annual health checkup at the workplace and community healthcare centers. Main inclusion criteria are age (20-65 years) and fasting plasma glucose (100-125 mg/dl). Participants are assigned to either the intervention group (IG) or the control group (CG) by the healthcare centers they belong to. Each participant in the IG is given a weight scale and a pedometer and receives regular newsletters. In addition, he/she is provided with about six interventional phone calls by health nurses or dietitians to facilitate to achieve healthy life style in the first year. Each participant in the CG is also given a weight scale, a pedometer, and receives regular newsletters, but no phone calls. The contents of newsletters and phone calls are focused on four major topics; exercise, weight control, vegetable intake, and alcohol intake. Main endpoint of this study is an incidence rate of T2DM defined as fasting plasma glucose 126mg/dl or over on annual health checkup or diabetes diagnosed by a physician. Secondary endpoints are BMI, habits of diet and exercise, and health behavior change. Follow-up period is 3 years.
Results: The total number of clusters was 43 (22 in the IG, 21 in the CG). By the end of January 2009, 2904 subjects were registered (1375 for the IG, 1529 for the CG). Participation rate was 20%. Mean age of the registered participants was 49 years old, 84% was male, mean BMI was 24.3kg/m^2, and mean fasting plasma glucose was 106mg/dl. Between the IG and the CG, there was no difference in age, male-to-female ratio, BMI, and fasting plasma glucose. Approximately 82% of the participants in the IG had finished receiving intervention by the end of January 2009. This study is currently in progress.
Conclusions: This is a large-scale preventive study and intervention is carried out not face-to-face, but by telephone call from the health professionals. The result of this study could contribute to make a strategy for T2DM prevention and provide scientific evidence to national health policy in Japan.
This research is supported by a Health and Labour Sciences Research Grant for Research on Diabetes from the Ministry of Health, Labour and Welfare, Japan.

No conflict of interest

D-0870

Diabetes can be prevented: a six–month campaign at www.fundaciondiabetes.org

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Background: Clinical evidence has proven that primary Type 2 Diabetes (DM2) prevention is attainable when modifiable risk factors are impacted. Via its Diabetes Strategy, Spain's National Health Service has been staging awareness campaigns directed at the general public, regarding inherent DM2 risks and healthy lifestyle patterns, which serve to prevent or delay the onset of this condition.
Objective: The aim has been to ascertain to what degree on-line information campaigns would be useful in preventing diabetes and obesity. This is achieved via personal DM2-risk self-testing and customized lifestyle adjustment recommendations, made in accordance with each person's risk profile.
Method: The FINDRISK population DM2-risk filter Test comprises 8 scored questions, the results of which serve to predict what the chances are that the person will develop DM2 over the coming 10 years, with 14 points having been set as the most likely cut-off point in predicting high risk probability.
The FINDRISK test is just part of an interactive program that facilitates risk factor self-testing and which, based on this risk factor, will recommend lifestyle changes that could help avoid or delay the onset of DM2.
Results: The Campaign got underway on September 30th 2008 and, by March 30th 2009, 13,511 on-line tests had already been done: 72.74% in Spain, 21.98% in Latin America and 5.28% in other countries, of which 44.93% were men and 55.07% were women.
Spain. Of the 9,828 tests done, 14.87% scored 14 points and over on the Findrisk scale. There were 4 age groups, as follows: under-45s, 45 to 54s, 55 to 64s and over-64s. The resulting 14+ high-risk factor percentage groups were as follows: 6.1%; 20.9%; 33.4% and 39.7%. BMI was greater than 30 for 14.4% of all participants. BMI breakdown, by age groups, was: 11.0%; 18.1%; 21.8% and 17.0%. Contrary to results in other categories, however, moderate levels of physical exercise, as declared by 51.0% of all participants, showed an increase with age: 44.9%; 54.0%; 64.6% and 72.9%.
Latin America. Of the 2,970 tests done, 21.3% scored 14 points and over on the Findrisk scale. There were 4 age groups, as follows: under-45s, 45 to 54s, 55 to 64s and over-64s. The resulting 14+ high-risk factor percentage groups were as follows: 10.3%; 31.2%; 46.0% and 64.1%. BMI was greater than 30 for 23.5% of all participants. BMI breakdown, by age groups, was: 20.4%; 28.6%; 27.2% and 31.5%. 39.8% of all participants practice moderate levels of physical exercise. By age groups: 36.4%; 40.1%; 53.2% and 52.2%.
Conclusion: The high number of on-line FINDRISK tests completed, serves to prove citizen awareness campaigns are viable, interactive, multinational, low cost and open to an ever-increasing number of people, via the Internet.

No conflict of interest

D-0871

Pre-diabetes, weight loss and well being

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Objective: Prediabetes is a serious public health problem. Successful diabetes prevention programs have shown that weight loss, healthy eating with less than 25% from fat, and 150 minutes of physical activity can slow or halt the progression from prediabetes to diabetes. The goal of this project was to evaluate a weight loss program implemented for people with prediabetes.
Design/methods: Diabetes Prevention program consisted of a one time two hour pre-diabetes class; using the Small Steps, Big Rewards tools from the National Diabetes Education Program; followed by a 12 week group weight loss program called LEARN, team taught by an RD, CDE and behaviorist. Pre-program and post-program survey results were collected and tabulated. Self-reported behavior change results were reported by participants. WHO 5 survey

administered pre-program and post-program. Height, weight, blood pressure, waist circumference, and lab values were evaluated pre and post program. Qualitative results were tabulated and reported for "additional information". Percent of participants reporting greater than 150 minutes of exercise per week post program reported. Percent change in BMI, weight, blood pressure and waist circumference reported. The WHO 5 well-being score is reported in a percentage, a 10% difference indicates a significant change. Individual participant changes were scored.

Results: Of 23 participants enrolled, 19 (76%) completed the program. 93% of participants reported establishing a goal for weight loss, 93% of participants established a goal for physical activity and 86% of participants established a goal for calorie and fat intake. 47% of participants reported at least 150 minutes per week of physical activity. 72% reported being successful in behavior change. Participants average weight loss was 4.2%. Average change in waist circumference -3.2%. 86% had a two hour oral glucose tolerance test completed. Average change in WHO 5 was 15%. 71% of participants had significant change WHO 5 results, indicating a significant improvement in well-being post program.

Limitations: Pre-diabetes class preceded weight management program. Weight was measured at beginning of 12-week weight loss class, but pre-diabetes program initiated behavior changes in participants prior to weight collection. Actual weight loss results may have been greater if weight had been measured earlier in the program.

Conclusions: Improved well-being and positive behavior changes, in people with prediabetes, can be achieved by attending a weight management program. Diabetes educators need to increase the number of prevention programs and weight management programs offered to participants. Additional research needs to be undertaken to identify cost effective ways of implementing prevention programs.

Conflict of interest:
Advisory board: dLife Corporation, Ask the Expert

D-0872

Promoting diabetes prevention after gestational diabetes: the "Zoet Zwanger" project

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Background: The global burden of type 2 diabetes (T2DM) is rising rapidly, clearly driven by modifiable risk factors such as obesity and sedentariness. Effective prevention strategies are urgently needed to curb this epidemic. According to the IDF Consensus on diabetes prevention (2007), particular attention should be paid to targeting high risk populations. Women with gestational diabetes (GDM) are at the highest risk to develop T2DM early in life: up to 50 % will have diabetes within 5-10 years after delivery. However, follow-up after GDM is often lacking due to a low self-risk perception among these women, issues related to healthcare provider awareness, and specific barriers within healthcare systems. GDM women are not receiving appropriate postpartum screening according to current guidelines, and typically maintain health risk behaviour after delivery. On the other hand, promoting healthy, active lifestyles and 5-10 % weight loss may have a large impact on diabetes prevention in these young women.

Aims: "Zoet Zwanger" ("Sweet & Pregnant") is a new diabetes prevention project coordinated by the Flemish Diabetes Association (VDV) from 2009 to 2012 in the region of Flanders, Belgium, aimed at bridging the described prevention gap, by promoting metabolic follow-up and introducing realistic lifestyle interventions in women with previous GDM.

Methods: The first part of the project consists of an awareness campaign directed at all healthcare providers involved in the follow-up of GDM women using web-based materials, folders, posters, or information sessions. Secondly, women diagnosed with GDM will have the opportunity to participate in a GDM follow-up system (recall register), with annual reminders asking them to see their general practitioner for a check-up. The project will be implemented in collaboration with the region's professional associations of obstetricians-gynaecologists (VVOG) and general practitioners (Domus Medica).

A flow chart has been agreed between all partners involved, defining the steps in the process, from detection of GDM to registration in the system and defining the post-delivery follow-up strategy. Evaluation criteria include compliance with blood glucose screening, screening outcome, and BMI.

Expected results and conclusion: The perinatal registry (SPE) in Flanders indicates a (diagnosed) GDM prevalence of at least 2% and suggests an increasing trend. Women diagnosed with GDM receive information about treatment goals **during** pregnancy. With the proposed project we want to improve long-term outcomes **after** delivery by creating awareness on the likely progression to T2DM, and by using a follow-up strategy including lifestyle advice and early detection of T2DM.

Conflict of interest:
Other substantive relationships: The "Zoet Zwanger" project is funded by a grant from the Flemish authorities.

D-0873

Adult Health Promotion Record (AHPR) – a tool for prevention of diabetes, metabolic syndrome and cardiovascular disease

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Introduction: Cardiovascular disease (CVD) has become the main cause of mortality in most countries. Cigarette smoking, hypertension, dysglycaemia, dyslipidaemia and obesity are lifestyle-related modifiable risk factors of CVD. Metabolic syndrome is a constellation of CVD risk factors. Despite proof of concept, lifestyle modification has not translated into large scale community level prevention of diabetes and CVD.

Objectives: We aimed to develop a simple and low-cost tool for community level prevention of lifestyle-related diseases and health promotion (Adult Health Promotion Record – AHPR) targeting multiple and clustered CVD risk factors.

Methods: We identified CVD, type 2 diabetes, obstructive pulmonary disease, alcoholic cirrhosis, tobacco and lifestyle related malignancies as important causes of mortality, morbidity and economic loss in the world. Based on the existing evidence, we identified obesity, physical inactivity, tobacco smoking, hypertension, alcohol abuse, dyslipidaemia and dysglycaemia as related and common modifiable risk factors. The AHPR was developed to indicate graded risk for these risk factors. Visual scales coded in green, yellow, amber and red were constructed based on currently available ethnic and gender specific data. The AHPR was designed to indicate the level of risk in an individual and for disease prevention through empowerment and personal motivation. It includes vital messages and recommendations for health promotion and disease prevention. It can also be used for prospective follow up by the health care system.

Conclusions: This simple, low-cost tool for prevention of diabetes, CVD and other non-communicable diseases can be used in large scale community interventions for health promotion and disease prevention.

No conflict of interest

POSTER DISCUSSIONS

WEDNESDAY 21 OCTOBER

Complications - macrovascular 5

D-0874

Is asymmetric dimethylarginine (ADMA) a predictor of the diabetic cardiovascular diseases?

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Background and aims: Diabetic cardiovascular diseases are the common risks for determining morbidity and mortality in the diabetic population. ADMA has been established as an inhibitor of endogenous nitric oxide (NO) synthesis, and the relationship between ADMA and arteriosclerosis including cardiovascular diseases has been reported. If ADMA could become the predictor of diabetic cardiovascular diseases, we may prevent the progress of diabetic cardiovascular diseases and improve their morbidity and mortality. In the study, we have examined whether ADMA and other cardiovascular risk factors are the useful predictors for diabetic cardiovascular diseases, namely cerebro- and cardio-vascular events and peripheral artery diseases.
Materials and methods: We have analyzed 87 type 2 diabetic patients (47 men and 40 women, 40 to 83 years old, HbA1C 9.4±2.2%, BMI 23.4±4.2). After the measurement of the respective cardiovascular risk factors, we have followed up the enrolled type 2 diabetic patients for 5 years. We investigated the risk factors as follows, ADMA, angiotensin II, hepatocyte growth factor (HGF), advanced glycation end products (AGEs), plasma plasminogen activator inhibitor type 1 (PAI-1), mean intimal-medial thickness (IMT) and plaque score of the common carotid artery. Furthermore, we measured serum creatinine (Cr), creatinine clearance (CCr), albumin urine (U-Alb), blood pressure, cholesterol, triglyceride, free fatty acid, HbA1C, and calculated eGFR (male: $194 \times Cr^{1.094} \times Age^{-0.287}$, female: $194 \times Cr^{1.094} \times Age^{-0.287} \times 0.739$, CKD guideline in Japan). We compared retrospectively the above factors between 2 groups, with or without cardiovascular diseases.
Results: Ten people dropped out within 5 years, so we have finally analyzed with 77 patients. Diabetic cardiovascular disease developed in 15 cases newly within 5 years, and 4 cases recurred. The concentrations of ADMA in plasma (0.56±0.09 vs. 0.45±0.07μmol/l, p<0.00001) was significantly higher in 19 diabetic patients with cardiovascular diseases than in 58 diabetic patients without cardiovascular diseases. U-Alb (319.9±522.6 vs. 83.5±199.4μg/ml, p<0.001) and mean IMT (1.39±0.33 vs. 1.16±0.30mm, p<0.001) were also higher in patients with cardiovascular diseases. Any other risk factors were not associated with the development of the cardiovascular diseases within 5 years.
Conclusions: We demonstrated an association with diabetic cardiovascular diseases and high concentration of ADMA, U-Alb and high level of mean IMT. Above all, ADMA could be the most useful predictor of the diabetic cardiovascular diseases in type 2 diabetes.

No conflict of interest

D-0875

Association of sleep disorder with risk factors for cardiovascular disease in type 2 diabetic patients

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Aim: Sleep disorder, characterized by hypoxia during sleep and sleep loss, is known to be related with insulin resistance and cardiovascular risks. We studied the frequency and characteristics of sleep disorder in patients with type 2 diabetes.
Methods: We surveyed 780 patients with type 2 diabetes (395 male and 289 female, 54±12 years, body mass index (BMI) 24.8±3.3 kg/m2) to evaluate the sleeping disturbances. Pittsburgh Sleep Quality Index (PSQI) was used to evaluate the sleep quality, Berlin Questionnaire (BQ) to evaluate the severity of obstructive sleep apnea(OSA) and Epworth Sleepiness Scale (ESS) to evaluate daytime sleepiness. We observed the relationship between sleep disorders and clinical and biochemical characteristics.
Results: PSQI results showed poor sleep quality in 301 patients (38.4%), BQ showed 124 patients (15.8%) with high risk for OSA, and ESS showed 34 patients (6.3%) with daytime sleepiness. The high risk group for OSA was much more obese (BMI > 25 kg/m2) than non-obese group (26.1% vs. 8.1%, p<0.05) and was significantly higher in male than female (20.3% vs. 11.4%, p<0.05). In this group, sleep quality was poor (5.9±2.5 vs. 5.0±2.6, p<0.05) and daytime sleepiness scale was higher(5.3±4.4 vs. 3.5±3.0, p<0.05). Other factors such as BMI, systolic and diastolic blood pressure, serum insulin level, HOMA-IR, serum triglyceride level were significantly higher than low risk group (p<0.05). Logistic regression analysis showed male, BMI, HOMA-IR as a significant risk factor for OSA.
Discussion: Sleep disorder was commonly seen in type 2 diabetes and related to risk factors for cardiovascular diseases.

No conflict of interest

D-0876

The impact of glycemic variability on diabetes related complications: use of postprandial glucose as a proxy

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Aims/background: There is a growing body of evidence that the mere use of HbA1c is insufficient to reflect the metabolic situation of patients with diabetes mellitus adequately. The risk for development of diabetes related complications is apparently not only dependent on a long-term stability of glucose values, but also on the presence or occurrence of short-term glycemic peaks and nadirs in terms of minutes or hours during a day, leading thus to a phenomenon called glycemic variability.
We assessed the existing evidence for the clinical relevance of short term glucose variations and the existing different measures of glycemic variability.
Methods: Studies were selected for this review based on a search in MEDLINE and EMBASE using the following terms: "diabetes mellitus" or "postprandial glucose" or "glycaemic variability" in combination with the Boolean operator "AND": morbidity, mortality, cardiovascular disease, coronary heart disease, myocardial infarction, stroke, nephropathy, retinopathy, amputation. Studies identified from each search were examined for their relevance and actuality, because we applied no temporal search limits. Relevant citations were crosschecked for additional, relevant citations.
Results: 12 different measures for glycemic variability could be identified. Actually no gold standard for the assessment of glycemic variability does exist. The indices published in the literature vary in complexity, are serving different needs and often require continuous glucose monitoring devices (CGMS).
Only a few prospective trials in an ICU setting analyzed the impact of glycemic variability on patient relevant endpoints, but a plethora of epidemiological studies identify high postprandial glucose values as an independent risk factor for cardiovascular events.
Conclusion: There is growing evidence and consent, that intra-day glycemic variability plays a major role in the development of diabetes related complications. The use of PPG as a proxy for glycemic variability seems justified. Especially in patients with type 2 diabetes, achieving tight glycemic control with a limited intra-day variability of the glucose readings, can be attained by intensive monitoring in distinct intervals and the definition of target ranges, where adjustment of the therapeutic regimen should take place if readings are out of range (e.g. 7-point profiles during 3 days monthly). This method is an option in hand while awaiting tools and devices for the measurement of glycemic variability which are easier to handle and more affordable than the CGMS systems currently on the market.

No conflict of interest

D-0877

Prevalance of peripheral arterial disease (PAD) by means of ABI in asymptomatic type 2 diabetes patients and its corelation with hypertension and other metabolic factors

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Background and aims: Peripheral Arterial Disease (PAD) is common in diabetes subjects, though its prevalence is a function of the diagnostic

methods employed and patient's characteristics. Ankle Brachial Index (ABI) - a non invasive measure of peripheral arterial disease (PAD) is widely used in epidemiological studies. Aim of the study is to evaluate the prevalence of peripheral arterial disease (PAD) by means of ankle-brachial index (ABI) in asymptomatic Type 2 Diabetes patients.-stageI grade0 category0 (Fontaine's stages & Rutherford categories classification of PAD) in North Indian population.
Methods: Between winter 2005 & winter 2008, 2750 asymptomatic (no complaints pertaining to PAD) Type 2 Diabetes patients with mean age 50.37± 13.26 were enrolled. Blood pressure, BMI, baPWV, HbA1c, Total Cholesterol, HDL, LDL & Triglycerides values were collected. The ABI was measured with VP-2000/1000-Colin Corporation, hyayashi komaki, Japan. PAD was considered when ABI measured was <0.9 in either leg.
Results: An ABI <0.9 was found in **2.45%** patients. 60.30% subjects of positive ABI cases had HbA1c more than 7 (r = -0.005, p= NS). Subjects with ABI <0.9 were dyslipidemic as follows- 51.61% had cholesterol >200mg (r = 0.15,p=NS),58.04% had LDL>100 (r = 0.019, p=NS), 51.61% had HDL<35 (r = -0.07,p=NS) and 93.90% had TG>150 (r = 0.108, p=NS). Of those with PAD, 15.37% subjects were females. 64.51%patients were obese with BMI >25 (r = 0.023, p=NS). S.B.P>140mmHg was observed in 83.87%(r = -0.09,p=NS) and D.B.P>86mmHg was observed in 53.30% (r = -0.06,p=NS) among the subjects with PAD. 77.50% patients with positive ABI showed increased baPWV (arterial stiffness index) (r = 0.45, p=<.001).

Table: Correlation of Ankle brachial Index With other parameters

	p=values (RT)	p= values (LT)
baPWV (RT)	<.001	<.001
baPWV (LT)	<.001	<.001
HbA1c	NS	NS
BMI	NS	NS
S.B.P.	NS	NS
D.B.P.	NS	NS

Conclusion: Prevalence of PAD in this study of North Indian population, as represented by ABI<0.9, is LOW as compared to western population. No significant correlation of ABI was observed with Hypertension and other traditional risk factors. ABI had strong correlation with brachial pulse wave velocity –important marker of sub clinical atherosclerosis. However low prevalence of ABI <0.9 observed in this study really questions all of us whether such screening for PAD in asymptomatic diabetes population should really be kept as an option in future or not.

No conflict of interest

D-0878

Prevalence of obstructive sleep apnea in patients with metabolic syndrome

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Aim: Recent studies[1] have shown an association between diabetes and obstructive sleep apnea (OSA). Since OSA increases a patient's risk of cardiovascular disease, hypertension and stroke, diagnosis and managing OSA is important, especially in patients with diabetes, who are already at increased cardiovascular risk. Prevalence studies for OSA in patients with metabolic syndrome are sparse. The objective of this study was to determine the prevalence of undiagnosed sleep apnea in patients with metabolic syndrome who were referred to a community interdisciplinary metabolic syndrome clinic.
Methods: Patients referred to the Carling Metabolic Syndrome Clinic[2] for comprehensive management of their metabolic syndrome[3] completed the Berlin Questionnaire[4] in order to assess their risk for OSA. Patients who screened positive in the Berlin Questionnaire test were offered a sleep study for definitive diagnosis.
Results: Of the 44 consecutive patients with metabolic syndrome referred between March 2008- August 2008, 22 (50%) were female and the mean age was 54.9 years (range 36-77). Twenty eight (64 %) had type 2 diabetes and 7 (16 %) had impaired fasting glucose. Five patients were already using CPAP for sleep apnea and hence did not complete the Questionnaire. Nineteen patients (43 %) had negative results on the Berlin Questionnaire. Twenty patients (45%) scored positive and were offered a sleep study. Two patients declined. Of the 18 patients who underwent the sleep study, 11 (61%) had a positive result (3 mild, 7 moderate, 1 severe), and 7 had negative sleep studies.
Conclusion: Eleven of 44 patients (25%) referred to a metabolic syndrome clinic had previously undiagnosed sleep apnea. Five of the 44 patients (11%) were already being treated for sleep apnea. Overall prevalence of OSA in this study was 36%. Results of this study support screening all patients with metabolic syndrome for OSA in order to decrease the morbidity and mortality of these chronic conditions.

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No conflict of interest

D-0879

Effects of dietary ω-3 polyunsaturated fatty acids and statins in the treatment of type 2 diabetes mellitus patients with cardiomyopathy

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Aims: To study the effect of simvastatin (SIM), ω-3 polyunsaturated fatty acids (ω-3 PUFA) and their combinations on heart rate variability (HRV), dynamics of biochemical parameters in Type 2 diabetic patients with diabetic cardiomyopathy (DCMP).
Methods: 86 patients with Type 2 DM and DCMP (51,2±4,3 years), BMI 26,3±2,79 kg/m2 were observed. Patients were allocated to three groups. Patients of group A (n=25) received SIM 20 mg tid; B (n=37) - capsules of fish oil [(1,0 g eicosapentaenoic (EPA), 1,0 g docosahexaenoic (DHA)] acid and 0,1% α-tocopherol acetate tid; C (n=24) - SIM 10 mg tid plus capsules of fish oil. All patients were on the same diet. The duration of the study was 3 months. Statistics: ANOVA.
Results: Lipid disorders [high level of total cholesterol (TC), low density lipoprotein-cholesterol (LDL-C), triglycerides (TG) and decreased level of high density lipoprotein-cholesterol (HDL-C) in the patients with DCMP is accompanied by a decrease of root mean square successive difference (RMSSD), QTc interval parameters. It has been discovered that the monotherapy by SIM is accompanied by negative dynamics of activity of enzymes of a liver that proved by of ultrasonic scanning. After 3 months of treatment there was a more significant positively influenced were observed in group C. In particular, the increasing of RMSSD parameters (4,72±0,53 ms and 6,81±0,63 ms-after treatment, p<0,001), low- (LF), high-frequency (HF) bands (859,7±12,6 ms^2 and 1134,6±17,4 ms^2, p<0,001), coefficient of variation (CV), (8,7±0,3 % and 6,2±0,2 %, p<0,001). The authentic decreasing of QTc interval parameters (0,57±0,069 and 0,52±0,057, p<0,05), the increasing activity of superoxide dismutase (10,94±0,22 mcmol GSH/min 1 g Hb, p<0,001) were observed in the group C (Table).

Mean % change from baseline at 3 months	SIM (n=25)	ω-3 PUFA (n=37)	SIM / ω-3 PUFA (n=24)
RMSSD, ms	+14,9	+23,6*	+44,1**
LF, ms^2	+11,3	+19,8*	+30,2**
HF, ms^2	+20,1*	+16,5	+31,9**
CV, %	-10,3	-21,2*	-29,1**
QTc, s	-9,5	-11,4	-19,3*
LDL-C	-34,2*	-12,8	-52,9**
HDL-C	+15,3	+7,1	+26,8*
TC	-8,2	-12,5	-19,5
TG	-12,6	-35,4*	-57,4**

Treatment difference are presented with 95% CI. *p<0,01; **p<0,001
Conclusions: Usage of SIM and ω-3-PUFA are accompanied by decreasing of clinical developments of DCMP, significantly improvement of the lipid profile, HRV, QTc interval parameters. The combination SIM and ω-3 PUFA allows a lower dose of SIM, that allows to recommend their combination in the treatment of lipid disorders in patients with DCMP.

No conflict of interest

Complications - nephropathy 2

D-0880

Day-to-day variation of insulin requirements in type 2 diabetic patients with end-stage renal disease treated by maintenance haemodialysis

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Background and aims: We aimed to evaluate day-to-day variations of insulin needs in Type 2 diabetic patients with end-stage renal failure on maintenance haemodialysis (HD), as significant glycaemic excursions are frequent in this population.
Materials and methods: We developed a 24-hour euglycaemic clamp applicable to free living conditions in patients receiving 2200 calories with 55% carbohydrate in a standardized 3-meal and 2-snack regimen per day. Insulin was infused intravenously at variable rates, adjusted every 30 minutes to clamp the glycaemia at 5.55±1.11mmol/l over 24 hours pre-HD, during HD session, and 24 hours post HD. We studied 10 volunteers (6 men and 4 women, age: 55.7±8.7 years, duration of DM: 11.9±4.5 years, BMI: 22.7±4.5kg/m2, dry weight: 61.6±10.7 kg, duration of HD: 2.3±2.3 years).
Results: The mean capillary glycaemia was 5.5±0.3mmol/l pre-HD and 5.3±0.2mmol/l post-HD (p=0.39). This was achieved with the infusion of 23.6±7.7 IU/24h pre-HD vs. 19.9±4.9 IU/24h post-HD, indicating an overall 15.3% decrease (p=0.09). The basal insulin needs per hour were decreased significantly from 0.4±0.1/hour pre-HD to 0.3±0.1/hour post-HD (p=0.01). The total boluses were decreased by 2.2±3.1 IU (-18.6%, p=0.15). The change in blood urea induced by HD did not correlate with the change in daily insulin needs (r=0.1, p=0.79).
Conclusion: In conclusion, the 15% reduction in insulin needs to achieve normoglycaemia after versus before HD observed in these type 2 diabetic patients, being equivalent to almost 4 IU per day, is likely to be clinically significant despite marginal statistical significance. Further investigations with intermittent subcutaneous protocol based on the present results are warranted to further guide clinical practice recommendations.

No conflict of interest

D-0881

The efficacy of N-acetylcysteine in preventing contrast-induced nephropathy in type 2 diabetic patients without nephropathy

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Aim and introduction: Contrast media presentation to T2DM individuals with nephropathy intensifies the deterioration of renal function. N-acetylcysteine (NAC) is reported to have potential for contrast-induced nephropathy (CIN) prevention but there isn't enough study on diabetic patients without nephropathy. The aim of this study was to assess the efficacy of NAC for preventing CIN in T2DM without nephropathy.
Materials and method: A total of 45 patients without any pre-existing renal impairment (serum creatinine: SCr <1,1mg/dl) who were undergoing a computerized tomographic investigation and would be receiving radio-opaque medication (300 mg iohexaol/100 ml) were enrolled. They were randomized to have either high-dose NAC (1,200 mg) and hydration prophlaxis (Group 1; n = 25; M/F=13/12; age: 59,3±10,9 yrs) or only hydration (Group 2; n = 20; M/F= 11/9; age: 55,5±13,3 yrs). The creatinine levels were determined 48 hours later and the relationship between pre- and postprocedural creatinine was investigated.
Result: Both groups were analyzed for any rise in SCr. In Group 1 SCr decreased from 0,83 to 0,79 mg/dl, whereas SCr increased from 0,81 to 0,94 mg/dl in Group 2 (p>0,05 for both). However there was a significant difference between the creatinine dispcrepancies of two groups (p=0,03). Furthermore, the groups were analyzed according to overall incidence of CIN defined as: 1) 0,3 mg/dl elevation of creatinine from baseline or 2) an increment of 20% over baseline creatinine. The increase of SCr in Group 2 was significantly higher than in Group 1 in terms of the second definition (p=0,045).
Conclusion: Adding NAC to hydration seems more beneficial than hydration alone in preventing contrast-induced renal function deterioration in T2DM patients without nephropathy.

No conflict of interest

D-0882

Diabetes mellitus has an additive effect on vascular calcification in chronic kidney disease

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Aims: More than 2 million Canadians have Diabetes Mellitus (DM) and its prevalence is increasing. DM is the leading cause of chronic kidney disease (CKD) and end-stage renal disease (ESRD), and 40% of all patients on dialysis have diabetic nephropathy. Furthermore, 2-year survival rates are markedly reduced for dialysis patients with DM compared to those without DM. Cardiovascular disease (CVD) is the leading cause of death among patients with DM and/or CKD. Vascular calcification, which is a common feature of CKD, dialysis and DM, predicts mortality and may contribute to future outcomes. Patients with DM are more likely to develop macrovascular calcification than those without DM. Furthermore, medial arterial calcification has been shown to be a strong independent predictor of total CVD and of future CV events, strokes and amputations among patients with DM. The aim of this review was to compare the prevalence of vascular calcification among CKD patients in the presence and absence of DM.
Methods: A literature search using MEDLINE was conducted using the following terms: DM, CKD, ESRD and calcification. Studies reporting the prevalence or scoring of vascular calcification (i.e., aortic calcification index (ACI), coronary artery calcification score (CACS)) were used for data extraction.
Results: The prevalence of vascular calcification among CKD patients with DM was greater than in patients without DM: 54% to 92% vs. 8% to 54% (n=5 studies). DM was associated with increased ACI among CKD patients compared to patients without DM: 27% to 57% vs. 7% to 45% (n=2 studies). In addition, a greater proportion of patients with DM and CKD had CACS equal to or greater than 400 than those without DM: 28% to 55.7% vs. 3.5% to 6.9% (n=2 studies).
Conclusions: DM is associated with increased prevalence and severity of vascular calcification among patients with CKD. Given that vascular calcification is associated with poorer outcomes among DM and CKD patient populations, the additive effect of DM on vascular calcification among patients with CKD may hold greater significance. Further research on the effect of vascular calcification on patient outcomes and the prevention of its progression in DM and CKD is required.

Conflict of interest:
Employee: Lee Ferreira, Genzyme Canada Inc.
Commercially-sponsored research: Kristin Beard, Agro Health Associates Inc.

D-0883

Androgen versus erythropoietin for the treatment of anemia of predialysis diabetic chronic kidney disease (CKD)

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Aims and objectives: Chronic kidney disease is a microvascular complication of DM. Anemia is an important clinical manifestation to treat in chronic kidney disease. Many subjects with poor socio-economic status having CKD and anemia in a developing country can not afford the treatment with erythropoietin(EPO). This study was designed to see the efficacy of nandrolone in comparison with recombinant human erythropoietin (rh EPO) for management of anemia of predialysis diabetic chronic kidney disease. Initially 118 subjects were interviewed. All were explained about both the options of treatment modalities. On the basis of their consent they are divided into two groups.
Methods: Sixty adult diabetic patients with anemia of chronic kidney disease on conservative treatment were enrolled. Patients were divided into two groups (1 and 2) of 30 patients each. Group 1 patients received nandrolone deaconate 50 mg deep intramuscular and Group 2, recombinant human erythropoietin 100 IU per kilogram of body weight subcutaneously once weekly. Patients of both groups received oral supplements in order to maintain body iron stores.

All the relevant hematological and renal parameters were evaluated at the end of 3rd and 6th month.

Result: There was a statistically significant rise in hemoglobin concentration, packed cell volume, in both groups. The rise in hemoglobin concentration in Group 2 was more marked than in Group 1, at the end of 3rd (Group 1, 9.59-1.13 vs Group 2, 10.51-1.23; p value 0.004), and 6th months, (Group 1, 10.8-1.26 vs Group 2, 11.36-0.97; p value 0.057). Hemoglobin raised significantly in Group 1, at the end of 3rd & 6th months (8.61-0.94 vs 9.59-1.13; p value 0.001 and 8.61-0.94 vs 10.8-1.26; p value 0.001) & also in Group 2 (8.31-0.91 vs 10.51-1.23; p value 0.001 and 8.31-0.91 vs 11.36-0.97; p value 0.001). Packed cell volume was increased similarly like hemoglobin. Role of nandrolone on glycemic status was evaluated by HbA_1c & reduced in both groups, but significantly (p value 0.012) at the end of 6th months, on Group 1 than Group 2. Nutritional parameters of nandrolone was evaluated by albumin level, and showed significant increase (p value 0.001) in albumin level in relation with erythropoietin at the end of 3rd and 6th months.

Conclusion: Nandrolone, though not equally effective as erythropoietin, may be considered as a valid alternative therapy for the treatment of anemia of predialysis diabetic chronic kidney disease, specially for low socioeconomic population, to make the treatment more cost effective. Further study is needed to see the safety and efficacy for longer duration of treatment with nandrolone in diabetic CKD.

No conflict of interest

D-0884

Impaired erythropoietin response to anemia in diabetic nephropathy

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Background and aims: Diabetic nephropathy (DN) is associated with early development of anemia compared to chronic kidney disease (CKD) of other etiology. The main cause of anemia in CKD is deficiency of erythropoietin (EPO) production by damaged kidneys. The purpose of the study is to determine serum EPO level and its response to anemia in patients (pts) with DN.

Materials and methods: 131 pts with DN were studied (47 pts with diabetes mellitus (DM) type 1 and 84 with DM type 2) - 66 males, 65 females, mean age 50.6±14.7). Among them 59 pts had microalbuminuria, 72 macroalbuminuria. Glomerular filtration rate (GFR) was calculated using the Cockcroft-Gault formula. Renal function was evaluated according to stage of CKD of National Kidney Foundation-Kidney Disease Outcomes Quality Initiative (NKF/KDOQI) - 36 pts had GFR ≥90 ml/min/1.73 m^2, 44 pts had GFR 60-89 ml/min/1.73 m^2, 32 pts had GFR 30-59 ml/min/1.73 m^2 and 19 pts were with GFR 15-29 ml/min/1.73 m^2. Anemia was defined as hemoglobin (Hb) < 13.5 g/dl in men and < 12.0 g/dl in women by the definition of anemia for CKD by NKF/KDOQI. The prevalence of anemia in total group was 45.0% (59 pts). Serum EPO was measured using ELISA and the laboratory normal range of serum EPO was 4.3-32.9 mIU/ml (Biomerica). Pts with GFR<15 ml/min and treated by erythropoietin-stimulating agents were not included.

Results: Mean EPO level was similar in pts with anemia and without anemia 7.6±4.4 mIU/ml and 8.4±5.5 mIU/ml, respectively. We did not find significant differences of EPO concentration in anemic and non-anemic pts with microalbuminuria (9.0±4.2 mIU/ml and 8.5±5.8 mIU/ml, respectively) and macroalbuminuria (7.3±4.4 mIU/ml and 8.2±5.0 mIU/ml, respectively). Comparison of the level of EPO based on stages of CKD and between pts with micro- and macroalbuminuria also did not find significant discrepancy in EPO value. The significant physiological inverse correlation of EPO and Hb was found for pts with GFR=60 ml/min/1.73 m^2 (R=-0.25; p<0.05). And the intensity of correlation between EPO and Hb increased when GFR level enhanced: GFR=70 ml/min/1.73 m^2, R=-0.32; p<0.01, GFR=80 ml/min/1.73 m^2, R=-0.40; p<0.01 and at GFR=90 ml/min/1.73 m^2, R=-0.51; p<0.01. No correlation of EPO and Hb was observed in pts with GFR<60 ml/min/1.73 m^2.

Conclusion: The renal EPO production in DN pts with anemia is not elevated and remains inappropriately at the same level as in pts without anemia. Low response of EPO expression to anemia is observed when moderate decrease of GFR develops (GFR < 60 ml/min/1.73 m^2) and mainly is related with early disturbance of EPO production by interstitial cells of kidneys and other factors which may affect EPO metabolism in diabetes (neuropathy, inflammation, hyperglycemia etc.).

No conflict of interest

D-0885

Putting research into action in indigenous communities: improving public health practices and slowing the epidemic of ESRD in American Indians and Alaska Natives

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Epidemiologic studies of diabetes have been conducted in many indigenous communities. Translating the findings and techniques from research studies into preventive care is a key step to ensure that indigenous communities reap the benefits from these studies. In 1986, using health data from its outpatient facilities that serve 1.6 million American Indians and Alaska Natives (AI/AN) from 557 federally-recognized tribes in 35 states, the Indian Health Service (IHS) developed an annual audit of diabetes care and outcomes which reflects the risk factors for diabetes complications such as end stage renal disease (ESRD). A random sample of charts from the local registry is audited yearly either by hand or electronically to assess the implementation of current IHS Standards of Care for Diabetes. The Standards, created in 1986, are updated every two years and revised as research findings are published. In 1993 the IHS Standards of Care revision included recommendations to test for albuminuria, as epidemiologic studies had shown it to be associated with kidney failure in longitudinal studies of the Pima Indians. Subsequent revisions encouraged IHS providers to use the Albumin/Creatinine ratio and later the e-GFR to monitor for early kidney disease and treat more aggressively. From 1995 to 2004, rates of albuminuria screening in AI/AN with diabetes increased from 2% to 85%. In 1996 monitoring for use of ACE inhibitors/ARBs was added when studies showed that these agents could delay or prevent the onset of diabetic nephropathy. Rates of ACE/ARB use increased from 25% in 1996 to 69% in 2004. In 2004, 52% of AI/AN with diabetes had mean blood pressures below 140/90 mm Hg; mean systolic BP was 132.9 mm Hg and mean diastolic BP was 74.9 mm Hg. The United States Renal Data System (USRDS) monitors incidence of ESRD in the US by diagnosis and ethnicity. According to the USRDS, from 1994 to 2004 the age-adjusted diabetes-related ESRD incidence in AI/AN increased from 358.6 per million to a peak of 440.4 per million in 1999; by 2004 the incidence had decreased to 362.4 per million, and the decrease was attributed to improved diabetes management and reduction of other risk factors. Indigenous communities can benefit from the knowledge gained in studies by adapting information systematically to the local context and monitoring the implementation of preventive care.

No conflict of interest

D-0886

Association of left ventricular remodeling and chronic kidney disease in type 2 diabetic patients

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Background and aim: Left ventricular (LV) hypertrophy is an independent risk factor of morbidity and mortality in cardiovascular disease. Chronic kidney disease (CKD) is also a substantial risk of cardiovascular disease. Recently, stage of CKD is classified by estimated glomerular filtration rate (eGFR). LV mass is known to increase with progression of CKD stage in diabetic patients. The aim of this study is to evaluate the effect of CKD on LV remodeling in patients with type 2 diabetes mellitus.

Subjects and methods: Echocardiography was performed in consecutive 304 type 2 diabetic patients (199 men, age 59±13 years (mean±SD)) from January to December in 2005.

We measured LV ventricles by M-mode echocardiography, and calculated LV mass according to Penn's formula and indexed by body surface area (LVMI). LV remodeling was classified normal(N), concentric remodeling(CR), eccentric hypertrophy(EH) and concentric hypertrophy(CH) by LVMI and relative wall thickness. Stage of CKD was defined by eGFR according to the formula for Japanese ($0.741 \times 175 \times Age^{-0.203} \times Cr^{-1.154}$ (Female × 0.742) mL/min/1.73m^2), and stage(S) of CKD were classified as following eGFR;S1: ≥90, S2:60-89, S3:30-59, S4:15-29, S5:<15 mL/min/1.73m^2. We assessed the presence of

retinopathy and hypertension. Hypertension was defined as systolic blood pressure >140, diastolic blood pressure>90mmHg or taking antihypertensive drugs. BMI, HbA_{1c} and urinary albumin creatinine ratio (ACR) were measured.
Results: 304 type 2 diabetes patients were classified by stage of CKD, S1:53, S2:106, S3:68, S4:19, S5:58. The average LVMI increased with progression of CKD stage. (S1:104±24, S2:112±26, S3:118±30, S4135±29, S5153±36g/m^2, respectively). The proportion of LV remodeling classification in each CKD stage were S1(N 53, CR 13, EH 25, CH 9%), S2 (N 42, CR 13, EH 27, CH 18%), S3 (N 45, CR 10, EH 27, CH 18%), S4 (N 11, CR 21, EH 36, CH 32%), and S5 (N 16, CR 2, EH 54, CH 28%). On LV remodeling, around a half of patients was normal in CKD stage 1, 2 and 3, and high reverence of EH was shown in CKD stage 4 and 5.
We evaluated clinical factors for LV remodeling in each CKD stage by one-way analysis of variance. In S1 and S2, there were significant differences about age(N:57±12, CR: 61±12, EH: 61±11, CH: 65±12 years ($p<0.05$)) and hypertension(N 44, CR 62, EH 81, CH 71% ($p<0.01$))among LV remodeling. There were significant differences about BMI(N:24.9±3, CR: 22.6±4, EH:27.1±5, CH:27.6±5kg/m^2 ($p<0.05$)) in S3, and eGFR((N:11±6, CR:21±10, EH:10±7,CH:12±7ml/min/1.73m^2 ($p<0.05$)) in S4 and 5.
Conclusion: The LV remodeling progresses from N to EH with deteriorating CKD stages in type 2 diabetic patients. It suggests that a good control of blood pressure in early stage of CKD may play an important role for prevention of EH.

No conflict of interest

D-0887

Influence of insulin resistance on blood pressure level and on kidney function

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The purpose of this study was to assess the consequences of insulin resistance on blood pressure level and on urinary albumin excretion rate (UAE).
Methods: This study included 1936 non diabetic male subjects, mean age 37.8 ± 8 years. They were divided into two groups according to whether their abdominal circumference was less (group 1, N = 1722) or more (group 2, N = 241) than 102 cm, according to the NCEP-ATPIII criteria for abdominal obesity diagnosis. Insulin resistance was assessed by the HOMA index (Homeostasis Model Assessment = fasted insulin x fasted glycaemia / 22.5). Renal effect was appreciated by measurement of urinary albumin excretion rate.
Results: Subjects in group 2 were older than those in group 1 (42.4 ± 8.4 vs. 37.2 ± 8.6 years, $p<0.001$) and HOMA index was significantly increased (3.54 ± 2.35 vs. 1.72 ± 1.06, $p<0.001$). This index of insulin resistance was correlated with the waist circumference ($r=0.493$, $p<0.0001$). The blood pressure in group 2 subjects was significantly higher than in group 1 (SBP: 135 ± 14 vs. 125 ± 13 mmHg, $p<0.001$ and DBP: 82 ± 12 vs. 77 ± 9 mmHg, $p<0.001$). SBP and DBP were correlated with waist circumference ($r=0.256$, $p<0.0001$ for the SBP and $r=0.263$, $p<0.0001$ for DBP) and HOMA index ($r=0.215$, $p<0.0001$ for SBP and $r=0.210$, $p<0.0001$ for DBP). The waist circumference and HOMA index both explained 10% of BP variance with a major contribution of waist. The UAE of group 2 patients was significantly higher than those of group 1 (10 ± 20 vs. 18 ± 42 mg/l, $p<0.01$). It was correlated to HOMA index ($r=0.231$, $p<0.0001$), to the SBP ($r=0.178$, $p<0.0001$) and to the DBP ($r=0.144$, $p<0.0001$), these two first parameters explaining 7% of UAE variance.
Conclusion: Abdominal obesity was a cause of insulin resistance. Abdominal obesity and insulin resistance were both implicated in the increase of BP. In these patients, recorded UAE increase was either due in part to this increased blood pressure and also to insulin resistance, and is usually associated with an increased cardiovascular risk.

No conflict of interest

D-0888

Chronic kidney disease, but not metabolic syndrome, is a risk factor for cardiovascular disease in Japanese patients with type 2 diabetes. The Otowa Hospital Diabetes Observational Study 1 (OHDOS 1)

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Aims: Type 2 diabetes is a potent risk factor for cardiovascular disease (CVD). Recently chronic kidney disease (CKD) is increasingly recognized as an independent risk factor for CVD in the general population. In the same population, metabolic syndrome (MetS) is also associated with an increased risk of CVD. We conducted a retrospective chart review to investigate the clinical significance of CKD and MetS for atherosclerosis in Japanese patients with type 2 diabetes.
Methods: Overall 568 consecutive outpatients with type 2 diabetes who came to Rakuwakai Otowa Hospital in Kyoto, which is a teaching hospital with 588 beds, in 2003 were studied retrospectively for 6 years or until they experienced a cardiovascular event or died. CVD during follow-up was defined as myocardial infarction, angina, silent myocardial ischemia and stroke. Renal function was evaluated by estimated glomerular filtration rate (eGFR), proteinuria and urinary albumin. MetS was diagnosed using the International Diabetes Federation criteria. Statistical analysis was performed by Cox proportional hazard model to estimate hazard ratios of CKD and MetS.
Results: The mean age of 568 patients was 63±12 years. Approximately 38% of patients were women (350 men and 218 women). Median duration of diabetes were 10.0±9.7 years, and 21% of patients were taking aspirin. One hundred twenty patients had CKD (21.1%) and 233 patients had MetS (41.4%). The mean glycated hemoglobin (HbA1c) was 7.4%. HbA1c of patients with CKD was 7.3±1.2% and 7.4±1.4% in patients without CKD. HbA1c of patients with MetS and without MetS was both 7.4±1.4%. After 6 years follow-up, CKD had increased CVD risks (hazard ratio, 1.80; 95% confidence interval [CI] 1.13 to 2.86; p=0.013). However, MetS had not increased CVD risks (hazard ratio, 0.71; 95% CI 0.46 to 1.10; p=0.124).
Discussion/conclusion: CKD is associated with CVD risk factors, such as diabetes, dyslipidemia and hypertension. In addition, reduced renal function may be associated with increased levels of atherogenic risk factors, such as oxidative stress, inflammation and so on. On the other hand, It is reported that MetS is closely associated with low-grade adipose tissue inflammation that potentiates insulin resistance. MetS is characterized by visceral obesity, insulin resistance, and hypertension contributing to endothelial dysfunction and, subsequently, to accelerated atherosclerosis. In this study, our findings indicate that CKD was a risk of CVD in Japanese patients with type 2 diabetes. This result means that CKD is an independent risk factor for CVD in not only the general population, but also type 2 diabetes patients. Meanwhile, we suggested that MetS was not strongly associated with CVD in type 2 diabetes patients. In conclusion, diabetes is a strong risk factor for atherosclerosis and CKD, and CKD accelerates atherosclerosis in diabetic patients.

No conflict of interest

Diabetes in children

D-0889

Increasing prevalence of overweight at onset of childhood type 1a (autoimmune) diabetes mellitus

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Aims: We have previously reported that in children with insulin-treated diabetes mellitus at onset of their disease, the prevalence of being overweight more than tripled from 1979-1989 (period I) to 1990-1998 (period II). The current study evaluates whether this increase has continued in the period 1999-2006 (excluding the year 2003) (period III), focusing on those with evidence of autoimmunity.
Methods: All Black children < 19 years of age, diagnosed with diabetes and treated with insulin at onset, admitted to Children's Hospital of Pittsburgh during three periods (period I: 01/01/79-12/31/89; period II: 01/01/90-12/31/98 and period III: 01/01/99-12/31/06) were matched with White children by sex, age at onset and year of diagnosis. Data were obtained from retrospective review of medical records and ß-cell antibodies (ICA, GAD65, IA-2 and insulin autoantibodies) measured at onset. Overweight was defined as body mass index >= 85th percentile for age and sex.
Results: Data were available for 298 children out of 376 (79%). Overall, the prevalence of being overweight more than tripled from period I, 12.6% to period II, 36.8% increasing further to 41.1% in period III (p=0.001). Mean BMI percentile increased from 40.4 ± 36.2 in period I, to 58.8 ± 37.6 in period II and 60.4 ± 39.9 in period III (p=0.003). ß-cell antibodies were available for 219 (74%), of which 173 (78%) had at least one positive. This was similar in the three periods (81%, 76% and 87% in periods I, II and III respectively).
The prevalence of overweight (%) by period and antibody status is seen in the table below.

Prevalence of overweight	Period I	Period II	Period III
>= 1 autoantibody positive (n=173)	5%	25%	31%*
Absent antibodies (n=46)	46%	70%	75%

*p=0.002

The increase in prevalence of overweight was more noticeable in the African American children with autoimmunity (7.4% to 38% to 46% in the the the three periods respectively, p=0.008) vs Whites (3.2% to 14.1% to 18.7%, p=0.18). There was no significant difference in frequency of ketoacidosis between the three periods (36% vs 37% vs 39% respectively, p=0.92). The frequency of metformin plus insulin at follow up increased from period I (7.6%%) to period II and III (27% and 18% respectively, p=0.09). Five percent of children with evidence of autoimmunity were placed on metformin in addition to insulin.
Discussion/conclusion: The phenotype of children with insulin-treated diabetes at onset is changing. A third of children with type 1a (autoimmune) diabetes mellitus are now overweight despite frequent onset weight loss. The rise is greatest in African American children with evidence of autoimmunity. Prospective studies may determine whether this weight excess is related to the continued increase in type 1a diabetes incidence or if it affects rates of complications.

No conflict of interest

D-0890

Increased hepatic and skeletal muscle triglyceride content is associated with insulin resistance in adolescents

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Background: Excessive triglyceride accumulation in non-adipocytes is being elucidated as an important biomarker of glucose intolerance. Little information exists describing determinants of hepatic and muscle triglyceride in youth. This observational study of 78 normoglycemic adolescents classified as either healthy weight or overweight aimed to describe anthropometric and biochemical characteristics of youth considered at risk of glucose intolerance based on liver and muscle steatosis.
Methods: Hepatic and muscle triglyceride content was determined non-invasively with ^{1}H-magnetic resonance spectroscopy, allowing for discrimination of intracellular lipid accumulation. Percent body fat (DEXA), height, weight, and waist circumference were measured to assess anthropometric variables. Serum triglycerides and free-fatty acids during an oral glucose tolerance test were measured to investigate the association between level of lipemia and organ triglyceride content.
Results: We studied 63 overweight (BMI Z score: 1.9 ± 0.5) and 15 healthy weight (BMI Z score: 0.2 ± 0.6) adolescents aged 13-18yrs (mean 16± 2 yrs). Multiple linear regression analyses revealed hepatic lipid content was positively associated with percent body fat (p 0.05), BMI z score (p 0.001), and serum triglyceride levels (p 0.001). Muscle triglyceride content was not significantly associated with either anthropometric variables or serum triglyceride concentrations. Interestingly, hepatic and muscle triglyceride content were only modestly associated with one another, suggesting the potential for a unique pathogenesis of lipid accumulation in these organs.
Conclusions: 1H-magnetic resonance spectroscopy is a reliable method to non-invasively measure intracellular lipid content, and may be useful to advance future study of tissue steatosis. Our data suggest serum triglyceride levels and generalized adiposity (% body fat and BMI) are critical determinants of hepatic steatosis in adolescents. Lack of association of these variables with muscle steatosis suggests a unique as yet undetermined process which requires further study. Interventions aimed at reducing serum lipid, and percent body fat may reduce tissue lipid content, and the progression of glucose intolerance in youth.

No conflict of interest

D-0891

Monitoring of diabetes care in children with diabetes aged 0-18yrs in Georgia

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All children with diabetes in Georgia, aged 0-18yrs are registered at the DChPA, where following data were accumulated for 2004-2008: 2004–577 children registered (fresh diabetes mellitus (FDM)–62, girls–35, boys–27), 2005–581 children (FDM–63, girls–31, boys–32), 2006-594 children (FDM–81, girls–38, boys–43), 2007-602 children registered (FDM–85, girls–32, boys–53), 2008–639 children (FDM–70, girls–39, boys–31). In 0-18yr age group mean annual HbA1c levels were: 2004–9.56%, 2005–10.23%, 2006–9.25%, 2007–9.5%, 2008–9.16%. Following 4 groups (Gr.) were separated: Gr.1– age 0-5yrs; n=19; HbA1c (2006-2008)–7.93%, 8.88%, 8.86%, respectively. Gr.2–age 6-9yrs; n=74; HbA1c (2004-2008)–9.98%, 10.16%, 9.15%, 9.03%, 8.81%, respectively. Gr.3–age 10-11yrs; n=152; HbA1c (2004-2008)–9.44%; 9.95%, 9.0%, 9.16%, 9.04% respectively. Gr.4–age 14-18yrs; n=316, HbA1c (2004-2008)–9.58%, 10.34%, 9.75%, 9.31%, respectively. Fundus examinations were performed in all children once in 6 months. We found that 40 children had diabetes complications (retinopathy–29, cataract–11). Tuberculosis was diagnosed with Mantoux test PPD (K14/23, K997 biopreparation). Positive reaction had 36 DM children, all had tubintocsication (MGB negative). Their HbA1c (2004-2008) was: 9.5%, 10.28%, 9.52%, 9.26%, 9.2%, respectively. Eight children had extra-pulmonary MGB positive form, HbA1c–10.2%, 12.76%, 10.21%, 9.95%, 9.26%, respectively; 2–pulmonary MGB negative one; HbA1c (2005-2007)-8.45%, 8.34%, 8.95%, respectively; and 2 more-pulmonary MGB positive form, HbA1c (2003-2007)-10%, 11.03%, 10.78%, 11.19%, 9.33%, respectively. In all cases standard antituberculosis therapy was carried out. Positive clinical and X-ray changes were observed 2 months post treatment, complete reconvalescation - 6 months post treatment.

No conflict of interest

D-0892

Longitudinal growth in children with diabetes mellitus type 1

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Introduction: The diabetes mellitus type 1 (DM1) is one of the most frequent metabolic illnesses in children. The measurement of growth is a fundamental parameter in the follow up of the children with DM1. The objective of the study was to determined the growth pattern and its alterations in patients with DM1.
Methodology: We reviewed the clinical files of the patients from the endocrinology services at the INP with diagnosis of DM1.
Results: We studied 264 patients with diagnosis of DM1. 116 (43.9%) male and 148 (56 %) female, with an average age at the time of diagnosis of 8.5 years ± 4.0 years (3 months -189 months), and evolution time of 6.1 years (4-210 months).
The graphic appearance of the height and weight curves suggest that the varianzas of both characteristics according to the age. The height at time of diagnosis in the girls was similar to that of the boys pz -0.54 (-1.89 a 0.8 d.e.) versus 0.14 (-2.7 a 2.7), respectively. The boys weighed more than the girls 45.7 (18.3-81) pc 75 (5-95) versus 40.3 (18.7-75) pc 50 (10-95).
The height correlated inversely with the HbA1c (r= 0.8, p = 0.000). The weight correlated directly with the height (r = 0.955, p = 0.000). The speed of growth in the group with better metabolic control HbA1c < 9% increases significantly after seven years compared with the group with bad metabolic control HbA1c ≥ 9%. (6.9 ± 2.3 cm/year versus 4.4 ± 2.1 cm/year,) (p = 0.003) respectively.
Conclusions: Growth is significantly altered in children and teenagers with DM1. The pubertal peak is less and so the linear growth diminishes from the first year of evolution without a clear correlation between changes in metabolic control and weight.

No conflict of interest

D-0893

The use of premixed 30/70 insulin in high risk youth with type 1 diabetes: a quality audit

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Aim: To determine if the use of premixed 30/70 insulin reduced the incidence of DKA without deterioration in glycemic control or causing severe hypoglycemia in a group of high risk youth with T1DM.
Methods: 25 youth were identified sequentially in a 6 year period (2002-2008) who had suspected, deliberate insulin omission, A1c consistently >10%, recurrent DKA or an inability or unwillingness to use a more physiological insulin regimen. Glycemic control, measured as A1c, was evaluated at the initiation of premixed 30/70, 1 year after 30/70 start and at the most recent clinic visit using paired *t* tests. Incidence rates of acute complications were calculated. DKA was defined as a pH≤ 7.35 and $HC0_3$ <15. Severe hypoglycemia was defined as loss of consciousness or seizure.
Results: At initiation of 30/70, the youth (52% male) had a mean age of 14.5 years (range 12-17 years). Mean duration of diabetes was 5.2 years (range 2 months to 15.1 years). 12 youth switched from a TID regimen, 7 from a BID regimen, 5 from a basal-bolus regimen and 1 from an insulin pump. 15 youth (60%) had involvement with child welfare agencies. Mean follow-up was 15.1 months (range 2 months to 4.6 years). For the females (n=12), mean A1c decreased 0.87% by one year and 0.69% by their most recent clinic visit. For youth who had used 30/70 for ≥1 year (n=16), mean A1c did not change during the first year (11.51% at 30/70 initiation vs. 11.64% after one year). However, mean A1c decreased significantly by their most recent visit (-0.78%, p<0.05). Mean follow-up was 21.4 months (range 12 months to 4.6 years). There was 1 case of severe hypoglycemia (3.24 cases per 100 pt-yrs), and 8 episodes of DKA (25.90 cases per 100 pt-yrs). There were no deaths. It is difficult to determine if the use of 30/70 prevented DKA in youth at the DER-CA. Prior to switching to 30/70, 6 of these youth had at least one episode of DKA in the preceding 24 months; with the exception of one youth, none had DKA after switching to 30/70. 5 youth, none of whom had a prior history of DKA, each experienced one episode of DKA after switching to 30/70. In this group, it is arguably a victory to have minimized their individual risk of DKA to one case each.
Conclusions: The use of premixed 30/70 insulin is a viable option for high risk youth with T1DM. Although, the incidence rate for DKA for these youth using 30/70 insulin is almost 7 times that found in the overall population of children with T1DM at the DER-CA, this report suggests that 30/70 may be effective in increasing adherence to insulin injections without increasing severe hypoglycemia or worsening glycemic control; 72% of youth had an improved or unchanged A1c while using 30/70.

No conflict of interest

D-0894

The first experience of insulin detemir in Georgia

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The aim of this work was to define efficacy of basal Insulin Detemir and NPH in patients with Type 1 Diabetes during intensive insulin therapy.
Materials: The study comprises of 111 patients with Type 1 Diabetes of 14-22 years of age. Subjects received Insulin Detemir (Det) or NPH once daily, plus human insulin at mealtimes for 24 weeks. In the first Group were included 53 patients on Det, Gr. 2 – 58 patients – on NPH. Gr. 1 age – 19.5 ± 1.69 yrs, diabetes duration 8.3 ± 2,16 yrs, HbA1c – 9,0 ± 1,51%. The patients performed glycemic self-monitoring (3 days per week– 6-7 measurements).
Results: HbA1c level decreased in both groups: in Gr. 1 – by 1.39% (p=0,000), Gr.2 – by 1.38% (p=0.000). Fasting gl. (FG) in both groups at the baseline was: Gr. 1 – 198.2 ± 20.8 mg/dl and Gr. 2 – 201.5 ± 24.9 mg/dl (p=0.876), and after 24 weeks FG level decreased in Gr.1 by 59.3 mg/dl (p=0.000) and in Gr.2 by 41.1 mg/dl (p=0.000), however in Gr.1 FG level was statistically significantly lower, in comparison with Gr.2 (p=0.000).Postprandial gl. (PG) in both groups at the baseline was: Gr. 1 – 256.4 ± 19.8 mg/dl and in Gr. 2 – 258.8 ± 17.6 mg/dl (p=0.500), and after 24 weeks PG level decreased in Gr.1 by 92.1 mg/dl (p=0.000) and in Gr. 2 by 87.3 mg/dl (p=0.000). However in Gr. 1 PG level was lower, than in Gr. 2 (p=0.022). The rate of hypoglycemic episodes during the last month of the study was in Gr. 1 – 13.3 ± 4.04 hypo/month and in Gr. 2 – 19.7 ± 5.28 hypo/month (p=0.000).
Opthalmological investigation detected no deterioration of retina in both groups.
Conclusion: In patients with Type 1 diabetes the similar decrease of HbA1c levels has been observed, both treated with Insulin Detemir and NPH, however FG and PG levels have been lower in the patients on Detemir, and the rate of hypoglycemic episodes (especially nocturnal) has been lower in the patients on NPH. Utilizing of Detemir as basal insulin during intensive insulin therapy, obtained more stable course of diabetes, in comparison with those of NPH. Immediate pre-meal injection has been assessed positively by all patients.

No conflict of interest

D-0895

Calcitriol administration in type 1 diabetic adolescents and its effect on bone turnover

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Background and aims: In recent onset Type 1 Diabetes (T1D), the lack of anabolic effect of insulin and amylin may disturb bone remodelling, particularly in puberty, a critical period for bone mass increment. The role of other factors, such as blood glucose control and vitamin D in bone remodelling is not clear. Aims of the study were to determine the effect of metabolic control and 1 year treatment with calcitriol on bone turnover in subjects with T1D by analyzing Osteocalcin (a bone formation marker) and ß-CrossLaps (a bone resorption marker).
Methods: In a double blind study, 25 subjects with recent-onset T1D and baseline C-peptide > 0.25 nM, were randomized to calcitriol at 0.25 µg daily

dose or placebo, and followed-up for 1 year. Osteocalcin and ß-CrossLaps, were evaluated by ECLIA method (modular E170, Roche Diagnostics, Mannheim, Germany) at diagnosis and at 1 year follow-up.

Results: At onset, Osteocalcin and ß-Cross Laps levels were not different from literature-derived values for heathy subjects, and remained unmodified after 1 year in placebo group, despite improvement in blood glucose control. Conversely, at 1 year follow-up osteocalcin and ß-CrossLaps dropped by 38.6% and 47.3%, respectively in the calcitriol treated group, but their levels were not significantly different compared to diagnosis due to high variability. No significant differences were also found at 1 year comparing calcitriol vs. the placebo group for both osteocalcin (25.1±3.6 (sem) ng/mL vs 46.1±14.2 (sem) ng/mL; p=0.157) and ß-CrossLaps (0.29±0.6 (sem) ng/mL vs 0.48±0.1 (sem) ng/mL; p=0.151). By stratifying patients according to age, we found that at 1 year follow-up as compared to diagnosis, calcitriol treated patients ≤18 years of age (mean age 16 years ± 1.46) showed statistically significant 61% drop of osteocalcin (68.8±17.6 (sem) ng/mL vs 26.8±11.5 (sem) ng/mL, respectively, p=0.04) and a 67% reduction in ß-CrossLaps (0.92±0.77 (sem) ng/mL vs 0.31±0.08 (sem) ng/mL, respectively, p=0.09). In this age range, patients on calcitriol therapy vs. placebo showed at 1 year follow-up a trend for lower osteocalcin (74.2±23.7 (sem) ng/mL vs 26.8±4.8 (sem) ng/mL; p=0.08) and significantly lower ß-CrossLaps (0.76±0.15 (sem) ng/mL vs 0.31±0.1 (sem) ng/mL; p=0.03). Differences were not statistically significant in patients >18 years of age.

Discussion/conclusion: Improvement in metabolic control is not associated with significant modification in bone turnover following calcitriol treatment. On the other hand calcitriol treatment reduces markers of bone turnover in the adolescent cohort, indicating that it may counter the physiological increase in bone turnover during puberty.

No conflict of interest

Foot care 3

D-0896

Risk factors for major amputation of diabetic foot gangrene

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Background: Diabetic foot ulcers are very common in the Philippines, accounting for 16-20% of the yearly emergency room admissions at the Philippine General Hospital. Major amputation (below & above the knee amputation, hip disarticulation) rate was 70%. We look into the risk factors for major amputation among diabetic foot ulcer patients after a multispecialty team named Diabetes Extremity Care Team (DECT) was created. No data has been reported from the Philippines.

Objectives: To compare the clinical and biochemical characteristics of diabetic foot ulcer patients who underwent major amputation and those who underwent minor and non-amputation and; to identify the risk factors associated with major limb amputation.

Methods: Cross-sectional, analytical. A retrospective review of charts was done from 2004 to 2007 with the diagnosis of diabetic foot ulcer. Five-hundred one charts reviewed (retrieval rate: 76%); 9 excluded (lost pages). University of Texas was used in the classification of diabetic foot ulcers. Difference in means was tested using T-test and difference in proportions tested using Chi Square test. Multiple logistic regression analysis was done to determine which variable was associated with major amputation.

Results: Major amputation was done in 51.42% (253 of 492) of patients which was significantly lower than the pre-DECT at 70% (p<0.001) however still above the ADA recommendation of <40%. There was a non-significant association with major amputation and male sex (49.01%, 149 of 492, OR: 1.05, p0.806), smoking (49.03%, OR:1.05, p0.792), alcohol abuse (48.75%, 1.02, p0.932), retinopathy (59.01%, OR:1.03, p0.899), nephropathy (50.66%, OR: 1.09, p0.537) ischemic heart disease (49.27%, OR:1.05, p0.795), peripheral vascular disease (49.2%, OR:1.07, p0.714), hypertension (49.33%, OR:1.08, p0.675), >25% missed antibiotics dose (50%, OR: 1.13, p0.497), duration of diabetes > 5 years (53%, OR: 1.17, p0.497) compared to the minor or non-amputation group. On multiple logistic regression, University of Texas 3D (OR: 2.2, p<0.01) and neuropathy (OR: 1.63, p0.02) were the predictors for major amputation.

Conclusion: Major amputation was done in 51.42% of diabetic foot ulcer patients. This study showed that patients with neuropathy and University of Texas 3D classification were likely to undergo major amputation, thus the need for adequate foot care among diabetic patients.

No conflict of interest

D-0897

Foot ulceration and lower limb amputation in diabetic patients at Ataturk Training and Research Hospital in Turkey

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Lower extremity ulcers are a serious complication of diabetes. Whereas only 7% of the population has diabetes in Turkey, prevalence of diabetic foot ulcer can be more. The aim of this study is to establish the condition in our patient group. Data were collected from the hospitalized patients at our hospital in a 2-year period. Totally 1777 patients were evaluated for diabetic complications, diabetic foot lesion, diabetes duration (new diagnosis, 0-10 years, 11-20 year, 21-30 year, >30 year). 977 of them were female (55%), 800 of them were male (45%). 303 (17.1%) patients had serious diabetic foot ulcer, 195 of them were male (24.4%), 108 female (11.1%) (p<0.001). Amputation was applied to 39 (12.8%) patients 26 of whom were male (66.6%). When the patients who have diabetic foot ulcer were investigated, it was found that 293 (77.8%) patient had diabetic neuropathic symptoms. According to the evaluation of diabetes duration, it was noticed that the patients who had diabetes for >30 years had more diabetic foot ulcer (31.3%), but amputation rate is higher in the group which has diabetes for 21-30 years (46.8%). As a result it can be concluded that diabetic foot ulceration and amputation is highly prevalent in Turkish population. Diabetic neuropathy is an important risk factor. Males seem to experience diabetic foot ulceration and amputation more. Also as the diabetes duration increases, incidence of diabetic foot ulceration and amputation increases. This emphasizes the need for all those who provide diabetes care for diabetic patients to recognize high risk patients and refer them to specialized centers as soon as possible.

No conflict of interest

D-0898

Actovegin use in complex treatment of diabetic foot syndrome complicated by purulent necrotic process

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Aim: to evaluate actovegin influence on wound process course in patients with diabetic foot (DF), complicated by purulent necrotic process.

Method: In 2007-2008 patients with DF, complicated by purulent necrotic process, presenting the main and comparison groups, were treated; there were 150 patients in each group. In both groups with neuropathic form of DF patients with trophic ulcer prevailed – 44.34 % and 46.67 % accordingly; in patients with neuroischemic form of DF with magistral changed blood flow trophic ulcer, osteomyelitis, phlegmon and toe gangrene were met in 20-28 % of cases. In the group with neuroischemic form with collateral blood flow patients with toe gangrene prevailed – 62.5 %. Complex therapy was administered in both groups, and in the main group 20 % solution of actovegin intravenously (dissolved in 0.9 % solution of NaCl, vol. 250 ml, NO. 10) was included with the following administration of 200 mg thrice a day within 3 months. For result evaluation, wound surface area was measured and wound healing speed (WHS) was calculated. Cytological investigation of Pap smears was done to determine wound process phase.

Results: In main group patients with magistral blood flow WHS was 6.98±0.85 % per day (p=0.001); term of the second phase starting of wound process – 18.6±3.5 days (p=0.007). WHS in patients with magistral changed blood flow was on average 3.43±0.73 % per day (p=0.04). The second phase of wound process took place in 30.97±9.8 days (p=0.008). In patients with collateral blood flow WHS was on average about 2.87±0.62 % per day (p=0.05). The second phase of wound process started in 50.07±15.03 days (p=0.009).

Conclusion: Reliable WHS increase and term decrease of the second phase starting of wound process in patients with DF, complicated by purulent necrotic process, took place after administering complex therapy with actovegin preparation (20% solution, dissolved in 0.9 % solution of NaCl, vol. 250 ml, NO. 10, with the following administration of 200 mg of it thrice a day within 3 months).

No conflict of interest

D-0899

High prevalence of undiagnosed diabetes and amputations in patients with leg infections in an African setting: case of Yaounde central hospital

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Background: In 2007, almost 80% of diabetic patients in developing countries are unaware of their status. Consequently, the disease is usually revealed by complications among which diabetic foot infections and/or gangrene. Unfortunately, these may contribute to a higher rate of amputations, which could have been avoided. This study was carried out to determine the prevalence of diagnosed and undiagnosed diabetes in patients with leg gangrene and/or acute infections at the Yaoundé Central Hospital (Cameroon), and short term rate of amputations in these diabetic patients.
Methods: From August 2006 to January 2008, we consecutively recruited all patients admitted for gangrene and/or acute leg infections, non related to a major trauma. Participants were screened for diabetes using standardized methods for those who were not known to be diabetic before the lesions. The follow up was done until discharge from the hospital.
Results: Out of 73 patients included in analysis, 49% were known diabetic with a mean duration of diabetes of 10 years. Among those remaining, 19% had undiagnosed diabetes. During the study period, 40% of all these diabetic patients were amputated of the foot, with 42% being major amputations. The amputation rate was not different between known and undiagnosed diabetic patients.
Conclusions: In hospital settings in our environment, diabetes mellitus is the main aetiological factor for gangrene and acute limb infections, but remains unknown in about 19% of patients before hospital admission. Unfortunately it is still associated to high incidence of amputation. This suggests that systematic detection of diabetes and early adequate management of the lesions should be aggressively implemented.

No conflict of interest

D-0900

Distribution of foot pressure of patients with diabetic foot syndrome after amputations of toes

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Aim: The aim of work was to check if the amputations of toes influence the distribution plantar pressure.
Methodology: From among 1166 patients from Outpatient Clinic for Diabetes Foot Syndrome, 192 amputations of toes were executed. In 74 of them pedobarogram after the amputation were executed using the pedobarograph MediCapterus co-operating with program TWIN99. Maximum value of pressure was estimated in four regions of foot: 1. lateral and 2. medial areas including phalanges and the heads of the metatarsal bone; 3. area including the remaining part of metatarsal bone and tarsal; 4. area including heel. The Clarke's angle was also estimated.
Patients were divided into two groups: with and without amputation of great toe. The patients with amputation of great toe and other toes were not analyzed.

gender	58 men	16 women
diabetes	69 type 2	5 type 1

Characteristic of the patients

Amputation	Numbers	Age (year)	Max pressure (g/cm²)	Average pressure (g/cm²)
Great toe	17	66,8 +/- 10,9	890,7 +/- 235,4	344,8 +/- 111,4
Other toes	39	65,4 +/- 9,2	846,6 204,1+/-	341,3 +/- 118,3
Both	18	69,8 +/- 10,9	852 +/- 228,2	385,9 +/- 132,7

Characteristic of the patients (continuation)

Results: There were no statistic significant differences between groups in average and maximum pressure (890,7 +/- 235,4; 846,4 +/- 204,1 g/cm²; p=0,2) as well as plantar foot surface after amputation (134,6 +/- 28,2; 146,2 +/- 32,8 cm²; p=0,44). A difference between maximum pressure in middle foot area (area 3) was found (268,1 +/-136,4; 387,3 +/- 158,2 g/ cm²; p<0,01) as well as value of Clarke's angle (26,2 +/- 15,4; 40,4 +/- 21,5 of degree; p<0,01).

Amputation	Area 1 (g/cm²)	Area 2 (g/cm²)	Area 3 (g/cm²)	Area 4 (g/cm²)	Clark's angle (degrees)
Great toe	0 +/-0,0	448,4 +/-241,2	268,1 +/-136,4	707,2 +/-252,6	26,2 +/- 15,4
Other toes	120,8 +/- 136,1	428,9 +/- 227,2	387,3 +/- 158,2	695,4 +/-219,3	40,4 +/- 21,5
p	<0,01	0,36	<0,01	0,42	<0,01

Conclusions:
1. So-called small amputations of toes significantly influence the redistribution of maximum plantar pressure.
2. The amputations of great toe lead to axial platypodia.
3. There is a question why some patients after the amputation do not have axial platypodia.

No conflict of interest

D-0901

Risk factors for amputation in diabetic foot patients

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Aims: Prevalence of diabetes mellitus (DM) is systematically growing. Vascular and neuropathic complications decrease life expectancy, quality of life, and create serious socioeconomic burden. Proper management of diabetic foot allow to avoid or delay surgical interventions. However, in many patients distal and proximal foot amputations are still necessary.
Our aim was to identify potential risk factors for complications leading to foot amputation in patients diagnosed with diabetic foot.
Methods: Study involved 157 patients admitted at the Outpatient Clinic for Diabetic Foot at the Department and Clinic of Gastroenterology and Metabolic Diseases, Medical University of Warsaw, and diagnosed with diabetic foot. Data was obtained through a detailed questionnaire including clinical evaluation by a specialist and patient's medical history. Study group consisted of 59 patients (47 males, mean age 60.5±12.0, BMI 29.6±6.1, 82.1% type 2 DM) who underwent amputation due to diabetic foot. Remaining 98 patients (61 males, mean age 63.6±11.2, BMI 28.4±4.6, 85.6% type 2 DM) comprised the control group. Statistical analysis involved univariate and multivariate logistic regression.
Results: Patients with a history of amputation were diagnosed with diabetic foot of neuropathic (45.8%), vascular (20.3%) or mixed (33.9%) etiology. Mean duration of DM in the study group was 16.6±10.9 and 14.3±8.4 in the control group. Amputation occurred in 14.6±10.7 year of DM, after 8.3±10.3 years of insulin therapy. Major risk factors were male sex (OR 1.60, 95%CI: 1.11–5.08), overall number of hospitalizations (OR 1.32, 95%CI: 1.08–1.62 for each additional hospitalization). They remained significant after adjusting for other covariates in a multivariate model. Age at diagnosis of DM (OR 0.87, 95%CI: 0.77–0.99 for each additional 5 years) was less important.
Conclusions: Higher risk of complications requiring amputation in patients diagnosed with diabetic foot appears to be associated with male sex, the number of hospitalizations and lower age at DM diagnosis. Therefore, it may be reasonable to provide them with additional care as a prophylactic measure.

No conflict of interest

D-0902

Early impact of comprehensive diabetic foot centre on diabetes-related amputation rates at Georgetown Public Hospital Corporation, Guyana

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Aim: To prevent amputations in persons with diabetes in Guyana.
Methods:
1. Identify high risk patients by 60 second screening and refer them for a follow-up and education program.
2. Exam feet at every clinic visit to identify ulcers at an early stage.
3. Treat foot ulcers at Diabetic Foot Centre (DFC), an interprofessional patient-centered unit, according to Wound Bed Paradigm, a holistic approach focusing on cause (vascular, infection, pressure); patient-centered concerns and local wound care with active surgical debridement of healable wounds.
4. Apply model throughout Guyana

Results: An audit of the first 9 months of activity (over 500 discrete patients) will be presented. One-half of the DFC patients are referred from Georgetown Public Hospital Corporation (GPHC): 36% screened and 15% inpatients with severely infected ulcers. The other half are referred from outside the GPHC system – reflecting the huge unmet need for diabetic foot care. A 3 year retrospective analysis of all major amputations performed at GPHC prior to the DFC will be compared to the first 6 month period after its initiation. The incidence rates of diabetes-related major amputations are calculated before and after the operation of the DFC. A retrospective comparison of hospital length of stay of patients with diabetic foot ulcers is made before and after DFC opened. Diabetes-related amputations rates in Guyana are benchmarked in comparison to that in other Caribbean and low-income countries.
Discussion/conclusions: World literature indicates that 85% of amputations in persons with diabetes are preceded by a diabetic foot ulcer (DFU). High major amputation rates reflect poor ulcer and patient-related outcomes. Previously unpublished data from Guyana show that 42% of patients admitted to GPHC with a DFU undergo an amputation, of which 45% are major, below-knee and above-knee, amputations and that 60% of admitted patients stay more than 1 week in hospital. Decreased amputation rates and lengths of stay are major indicators of improving quality of diabetic foot care.

Conflict of interest:
Employee: M.G. Rambaran, Georgetown Public Hospital Corporation

D-0903

An interdisciplinary approach to limb salvage: Toe, Flow & Metabolic Know approach

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There is an epidemic of diabetic limb loss that is increasing as the incidence and prevalence of diabetes mellitus increases throughout the world. Patients developing lower extremity complications of diabetes demonstrate significant morbidity and mortality. These include lower extremity ulceration. Limb loss in people with diabetes is a consequence of multifactoral pathology and it is therefore appropriate to utilize an interdisciplinary approach to address the specific and varying etiologies that combine to create lower extremity ulceration, infection, and subsequent amputation.
The components of the limb salvage team are largely determined by the major pathology noted at presentation. It is our experience that the irreducible minimum for such an interdisciplinary approach be founded in a team that is composed, at its core, of a) clinicians caring for the structural and surgical aspects of the foot, and b) clinicians caring for the vascular interventions into the foot, and c) clinicians caring for the metabolic physiological responses.
Healing and perfusion to the extremity are related in a sigmoid-esque curve. If we then apply that curve to the team, we are able to define who manages the patient at what time. It is vital to emphasize that the role of the "endocrinologist/diabetologist" for the metabolic know component is consistent along this curve.
If the acute problem at hand is more flow than toe, then the flow team takes primacy, pushing the patient up the healing curve. When that problem has been addressed, then the embedded toe team takes over to heal and prevent the problem. The literature demonstrates that each of these skills are vital in the management of diabetic lower extremity disease, and in combination, they provide the necessary starting point for targeted limb salvage.
The interdisciplinary approach to limb salvage has been demonstrated to provide improved efficiency in patient outcomes, with an overall decrease in major limb amputation rates. Such integrative teams allow for increased communication and perspective between team members, which fosters a spirit of learning and exchange of ideas that benefits both patients and team members.

No conflict of interest

D-0904

Diabetes related amputations: a call to arms to make a difference

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Diabetes related amputations remain a major public health issue, despite huge progress in offloading, aggressive wound healing protocols and prevention. Clearly, this progress is rather subdued when comparing the epidemic in developing and developed nations on the same scale. In many ways, diabetes-related amputations are strikingly similar to those associated with landmines. This intriguing comparison emphasizes the silent nature of the 'warfare' and the sinister consequences on the life of patients/victims. From a pubic health standpoint, diabetes-related amputations are now more common than those resulting from exploding hidden landmines, leading to 70% of the lower extremity amputations around the world. This high incidence of diabetes, coupled with the associated 43-55% five-year mortality rates after new-onset diabetic limb ulceration, which increase up to 74% for patients with lower-extremity amputation, will mount significant pressure on global healthcare infrastructure. It is striking to note that these mortality rates are higher than those for several types of cancer including prostate, breast, colon, and Hodgkin's disease. Despite a surprisingly high 5-year mortality associated with this preventable scourge, the lay public and press seem largely unaware and policy-makers have failed to appropriately respond. As with landmines, the effects of diabetes are irreversible. They both lurk silently before suddenly exploding, destroying the limbs and lives of their innocent victims. Diabetes around the globe results in one major limb amputation every 30 seconds, over 2500 limbs lost per day! In India alone, 40,000 amputations are performed annually. These staggering figures underline the enormous scale of the problem. On the other hand, there are two landmine related amputations every hour, but there are 1500 Non-Governmental Organizations and 90 countries working together to solve this landmine crisis, which has made huge differences The authors wish to sound the alarm. To save limbs, we call to arms the public, the media, the health care community, and policymakers throughout the world to join together in battle.

No conflict of interest

D-0905

The pilot screenings of diabetic patients - Introduction and follow-up of plastic offloading

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Aims: The pilot screenings commenced in 2007 were the introductory measures of the nationwide 7-center screening program. In the framework of the pilot screening, we have screened 1000 patients in four centres- in the gravity zones of Budapest, Debrecen, Gyöngyös and Pécs- which we linked with a modern method of offloading- and in cases of 99 patients we utilised weight relieving total contact soft cast.
Method: In cases with significant structural deformation and trophic wound on the sole, or where the risk of such existed, the patients were directed to the offlloading program, in the course of which plastic plaster was applied - with a structure adapted to the deformations.
In the examination year we applied such treatment instrument in the cases of 99 patients, out of which in 90 cases we were able to monitor it even beyond the required minimum follow-up time. We monitored the patients' wound healing tendency, the improvement of loadability, and changes in walk distance.

After one year we reexamed 71 patients. In this time we monitored the general health conditions- trophic ulcer and walking capacity.
Results: The early results: we offered immediate possibility for therapy to the high-risk patient-group, in the course of which we could record accelerated healing dynamics, and besides this the movement restrictiveness of the patients also decreased, thus we could measure also the psychic contentment.
The late results - after one year: No need for major amputation, less than 40% recidiv trophic ulcer (generally we use plastic plaster again). In this period we diagnosed one stroke, and one colon cancer.
Discussion: According to our conclusions, the pilot screening was succsessful, as it detected in more than 50% of the patients deformations, to which earlier no importance has been attached. We regard our initial results as the first step to a nationwide screening program to be carried out in 21 centres. We are even currently carrying on negotiations concerning the possibilities of joining the National Health Programs - as in Hungary there are 600.000 people with diabetes and at least 15% of them suffer from some kind of trophic disorders.

No conflict of interest

Incretin therapies

D-0906

Taspoglutide, a novel human once-weekly GLP-1 analogue, induces ß-cell proliferation and protects from cytokine- and lipotoxicity-induced apoptosis

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Aims: Glucagon-like peptide-1 (GLP-1) has protective effects on pancreatic ß cells. To test this hypothesis for taspoglutide, a human once-weekly GLP-1 analogue, its *in vitro* effects on insulin secretion, ß-cell proliferation and apoptosis were investigated and compared to native human GLP-1.
Methods: Acute effects of taspoglutide on insulin secretion in rat insulinoma (INS-1E) cells and human islets were studied under basal (2.8 mM) and high (16.7 mM) glucose concentrations. The effect on proliferation was assessed by EdU incorporation after 48 h exposure of murine pancreatic ß cells (MIN6) or rat islets in culture with taspoglutide. INS-1E cells or dispersed human islets were used to examine the effects of taspoglutide (10 nM) on apoptosis (quantified by TUNEL/DAPI or insulin staining using high-content screening) induced by cytokines (recombinant human IL1ß: 1 ng/ml + IFNgamma: 5 ng/ml + TNFalpha: 5 ng/ml, in 6 h culture) or lipotoxity (0.5 mM palmitate in 24 h culture).
Results: In INS-1E cells, taspoglutide dose-dependently increased glucose-stimulated insulin secretion without affecting basal secretion. An increase of 10.6% ($p<0.05$) was demonstrated at only 1 pM taspoglutide, and a larger increase of 177.7% ($p<0.001$) was seen at 100 nM. Proliferation of MIN6 cells was increased dose-dependently by taspoglutide, with almost a 4-fold increase at 100 nM (3.9±1.7; 8.3±1.4, 12.1±1.5, 13.5±2.9, and 14.2±1.8% at 0, 0.1, 1, 10, and 100 nM respectively; $p<0.001$). Taspoglutide almost totally abolished cytokine-induced apoptosis in INS-1E cells (Control 0.5±0.2; Cytokines: 2.2±0.4; Taspoglutide + Cytokines: 0.6±0.2%, $p<0.001$), and prevented lipotoxicity–induced apoptosis in INS-1E cells (Control: 0.5±0.2; Palmitate: 8.1±4.6; Taspoglutide + Palmitate: 0.5±0.2%, $p<0.001$). Comparable effects on ß–cell proliferation and protection from cytokine- and lipotoxicity-induced apoptosis were seen with human GLP-1 at the same concentrations. The protective effect of taspoglutide on cell proliferation and apoptosis was confirmed in dispersed rat and human islets.
Conclusion: Similar to human GLP-1, taspoglutide exerts multiple ß-cell protective effects including enhancement of insulin secretion, promotion of ß-cell proliferation, and prevention of apoptosis.

Conflict of interest:
Advisory board: Claes Wollheim (for F. Hoffman-La Roche Ltd)
Employee: Hayian Wang, Michael Prummer, Sabine Sewing, Sabine Uhles, Cristiano Migliorini, Elena Sebokova
(all employees of F. Hoffmann-La Roche Ltd)
Commercially-sponsored research: Domenico Bosco (a research contract from F. Hoffmann-La Roche Ltd)

D-0907

Chronic administration of the glucagon-like peptide 1 analog, liraglutide, delays the onset of diabetes and lowers triglycerides in a novel model of type 2 diabetes, the UCD-T2DM rat

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Aims: Due to the increasing prevalence of type 2 diabetes (T2DM), there is a need to identify T2DM prevention strategies. We have investigated the efficacy of liraglutide, a human GLP-1 analog, to prevent or delay T2DM in UCD-T2DM rats, a model of polygenic obese T2DM that is more similar in etiology to T2DM in humans than other existing rodent models.
Methods: At 2 months of age, rats were divided into three groups: control, liraglutide and food restricted (n=32). Rats received liraglutide (0.2 mg/kg) or vehicle injections BID for up to 10 months. Restricted rats were food restricted to equalize body weights to liraglutide rats. Non-fasting blood glucose was measured weekly to determine diabetes onset (<200 mg/dl). At 6 months of age 16 animals from each group were euthanized for tissue analyses.
Results: Energy intake and body weight at 4 months of age were lower in liraglutide and restricted compared with control rats: (control: 103±3kcal/d, 618±6g; restricted: 80±1kcal/d, 544±5g; liraglutide: 89±2kcal/d, 549±6g, P<0.0001). Greater energy intake in liraglutide compared with restricted rats, despite identical weight gain suggests that liraglutide increases energy expenditure. Compared with control, restricted and liraglutide delayed diabetes onset by ~2 and ~3 mo, respectively (P<0.01). Mean ages of T2DM onset were: control 4.9±0.5, restricted 6.9±0.5, and liraglutide 7.8±0.5 months. By 6.5 months of age, only 3/32 liraglutide animals had become diabetic, whereas 12/32 restricted and 26/32 control animals were diabetic. Thus, liraglutide delayed diabetes onset compared with the control and restricted groups (P<0.05). At 6 months of age, fasting plasma glucose and HbA1c concentrations were higher in control (180±27 mg/dl; 9.1±0.6%) compared with both liraglutide (119±8 mg/dl; 5.5±0.4%) and restricted (121±5; 4.9±0.2%) animals (P<0.001). Plasma TG was reduced in liraglutide treated (93±5mg/dl) compared with either control (137±10mg/dl) or restricted (175±16mg/dl) animals (P<0.05). Fasting plasma insulin at 4 months of age was lower in liraglutide (1.4±0.1ng/ml) treated compared with either control (2.9±0.2ng/ml) or restricted (2.6±0.2ng/ml) animals (P<0.001). After excluding animals that had become diabetic and started losing weight, liver TG content and total white adipose tissue weights were significantly lower in liraglutide (13.2±1.1mg/g liver, 74±4g, n=14) and restricted (13.0±1.7mg/g liver, 81±5g, n=14) compared to control (23.0±1.4mg/g liver, 98±4g, n=6) animals (P<0.01).
Conclusion: Liraglutide delays the onset of T2DM in UCD-T2DM rats and the delay likely involves effects on food intake, weight gain and energy and lipid metabolism. We are currently investigating other potential mechanisms including effects on islet morphology and function.

Conflict of interest:
Stock ownership: Cecilia Nilsson, Lotte Bjerre Knudsen, and Kirsten Raun - All have stock in Novo Nordisk A/S
Employee: Steven Griffen - Works for Bristol Myers Squibb.
Cecilia Nilsson, Lotte Bjerre Knudsen, and Kirsten Raun - All work for Novo Nordisk A/S
Commercially-sponsored research: Peter Havel - Novo Nordisk A/S funded this study, which was cconducted in Dr. Havel's laboratory.

D-0908

Liraglutide, a once-daily human GLP-1 analogue, reduces systolic blood pressure within 2 weeks in patients with type 2 diabetes

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Aims: Six large phase 3 clinical trials in patients with type 2 diabetes (T2D) have shown that the once-daily human GLP-1 receptor agonist liraglutide is effective in controlling glycaemia, as measured by HbA_{1c} reductions of 1.0–1.5%, while simultaneously reducing mean body weight by approximately 3 kg and systolic blood pressure (SBP) by 2.7–6.6 mmHg (min, max baseline SBP, mmHg: 128/76-134/81). Our aim was to study the effect of liraglutide on SBP by quartile of baseline SBP.
Methods: A meta-analysis across the six phase 3 liraglutide clinical trials (the Liraglutide Effect and Action in Diabetes (LEAD) programme) was carried out. Patients treated with liraglutide 1.2 mg (n=896), liraglutide 1.8 mg (n=1362) or placebo (n=520) were included in the analysis. Mean SBP changes from baseline were analysed using an ANCOVA model adjusted for trial, baseline SBP and baseline SBP quartile. The investigators were not given specific instructions on lowering blood pressure with medication during the trials.
Results: Baseline SBP in all treatment groups was similar. Overall, significant reductions from baseline in SBP were seen with liraglutide 1.2 mg (2.5 mmHg, p=0.0030) and liraglutide 1.8 mg (2.6 mmHg, p=0.0008) but not with placebo (-0.2 mmHg, p=0.7828). To investigate the longitudinal effect on SBP from baseline to week 26 repeated measure analysis with a model adjusted for baseline SBP quartile was used. The effect of baseline SBP quartile was significant (p<0.0001). At first visit after 2 weeks of treatment with liraglutide 1.2 mg or liraglutide 1.8 mg SBP was reduced by 3.0 mmHg and 2.6 mmHg, respectively, before any significant weight loss occurred. These reductions were maintained over 26 weeks. Thus, after 26 weeks of treatment SBP reductions of 2.7 mmHg and 2.6 mmHg with liraglutide 1.2 mg and liraglutide 1.8 mg, respectively, were observed. In patients receiving placebo SBP was reduced by 0.8 mmHg and 0.9 mmHg after 2 and 26 weeks, respectively. The greatest SBP reductions (-11.4 mmHg) were seen in the quartile with highest baseline SBP (Table).
Conclusions: Patients with T2D often have elevated blood pressure, which exacerbates CV risk. Treatment with liraglutide reduces SBP within 2 weeks, preceding any significant weight change. This effect on SBP was sustained over time and was enhanced in patients with baseline hypertension. Liraglutide may, therefore, have a beneficial effect on CV risk, especially in patients with high SBP.

	Liraglutide 1.2 mg Delta SBP	Liraglutide 1.8 mg Delta SBP	Placebo Delta SBP
Q4: 140<SBP≤190<sbp< />	-11.4 (1.2)	-11.4 (1.0)	-7.7 (1.3)
Q3: 130<SBP≤140<sbp< />	-6.2 (1.1)	-4.7 (1.0)	-2.4 (1.3)
Q2: 120<SBP≤130<sbp< />	+0.4 (1.1)	-0.4 (0.9)	+0.9 (1.3)
Q1: 80≤SBP≤120	+5.4 (1.1)	+4.8 (1.0)	+7.1 (1.3)
LS-Means (SE) for SBP (mmHg) change from baseline at week 26			

Conflict of interest:
Paid lecturing: Fonseca, Madsbad: Novo Nordisk
Employee: Falahati, Zychma: Novo Nordisk
Commercially-sponsored research: Fonseca: Novo Nordisk
Other substantive relationships: Fonseca, Madsbad, Plutzy: Novo Nordisk (consulting fees)

D-0909

Effects of exenatide compared to glibenclamide on glycaemic control and on insulin resistance in type 2 diabetic patients with metformin therapy

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Aims: Our study aimed to compare the effect of Exenatide (Ex) vs Glibenclamide (Gl) on glycemic control and on insulin resistance related-parameters in type 2 diabetic patients taking metformin.
Methods: Ninety-eight type 2 diabetic patients with uncontrolled type 2 diabetes (HbA1c > 8 %) were randomised to Ex 5 mg b.i.d. or Gl 2.5 mg t.i.d. and titrated after 1 month to Ex 10 mg b.i.d. or Gl 5 mg t.i.d. They were resulted intolerant to metformin at maximum dosage (3000 mg/day) and were taking various different doses (1000-2000 mg/day). The treatment period had a 9 months duration. We evaluated BMI, HbA1c, FPG, PPG, FPI, Homa index and collected plasma samples of retinol-binding protein-4 (RBP-4), and resistin at baseline, and after 9 months.
Results: Ninety-one patients completed the study (43 in Ex and 48 in Gl group). BMI was significantly reduced by Ex, but not by Gl (from 28.3±1.2 to 26.6±0.8 Kg/m^2, p< 0.05, and from 28.4±1.3 to 28.1±1.2 Kg/m^2, ns vs baseline, p< 0.05 vs Ex, respectively). HbA1c was decreased by 1.1±0.05 % (p< 0.01), and by 1.3±0.04 % (p< 0.01); FPG was reduced by 24±3 mg/dl (p< 0.01), and by 25±4 mg/dl (p< 0.01); PPG was decreased by 41±6 mg/dl (p< 0.01), and by 42±7 mg/dl (p< 0.01), in Ex and Gl group, respectively. FPI was decreased by 4.8±0.4 mU/ml (p< 0.05) in Ex group, and was increased by 1.1±0.07 mU/ml in Gl group (ns vs baseline, p< 0.05 vs Ex). Homa index was reduced by 2.5±0.7 (p< 0.05), and by 0.8±0.1 (ns vs baseline, p< 0.05 vs Ex), in Ex and Gl group, respectively. RBP-4 was decreased by 15.3±3.9 mg/ml (p< 0.05), and by 3.9±0.8 mg/ml (ns vs baseline, p< 0.05 vs Ex), in Ex and Gl group, respectively; resistin was reduced by 1.1±0.4 ng/ml (p< 0.05), and by 0.2±0.01 ng/ml (ns vs baseline, p< 0.05 vs Ex), in Ex and Gl group, respectively. There was a significant correlation between BMI value decrease and RBP-4 decrease (r= 0.63, p< 0.01), and resistin (r= 0.59, p< 0.01).
Conclusion: Ex and Gl improved diabetes control when added to metformin, but only Ex improved insulin resistance related-parameters. The RBP-4, and resistin reduction seems to be related to weight loss.

No conflict of interest

D-0910

Impact of liraglutide on reaching target HbA1c without weight gain or hypoglycaemia, versus other T2D therapies

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Aims: We conducted a post-hoc meta-analysis of the LEAD (Liraglutide Effect and Action in Diabetes) studies comparing the once-daily human GLP-1 analogue liraglutide with other T2D therapies, to determine how many patients achieved HbA_{1C}<7.0% as a single endpoint or the clinically relevant composite endpoint of: HbA_{1c}<7.0% + no major or minor hypoglycaemia and no weight gain.
Methods: The 6 phase 3 LEAD randomised controlled trials compared liraglutide as follows: liraglutide vs glimepiride (GLM) as monotherapy; liraglutide +metformin (MET) vs GLM+MET; liraglutide +GLM vs rosiglitazone (ROS)+GLM; liraglutide +ROS+MET vs placebo +ROS+MET; liraglutide +MET+GLM vs insulin glargine +MET+GLM; liraglutide +MET and/or GLM vs exenatide +MET and/or GLM. For this meta-analysis, data analysis was ITT, LOCF, and baseline-adjusted.
Results: At 26 weeks, more patients in the liraglutide 1.8 mg group reached HbA_{1c}<7% (66%) and the composite endpoint (42%) (Table). Odds ratios (ORs) for reaching single or composite endpoint were significantly greater for liraglutide 1.8 mg (p<0.05 vs all comparators) and liraglutide 1.2 mg (p<0.05 vs ROS, GLM, and placebo).

Conclusion: The composite endpoint reflects three clinically relevant outcomes in T2D (HbA_{1c}, weight control and hypoglycaemia). With the GLP-1 agonist liraglutide, the odds of reaching the composite endpoint (and also the odds of reaching HbA_{1c}<7%) were significantly increased.

See table 1

Conflict of interest:
Paid lecturing: J Buse, S Gough: Novo Nordisk
Advisory board: J Buse: Novo Nordisk
Employee: A Falahati, A Moses: Novo Nordisk
Commercially-sponsored research: B Zinman: Novo Nordisk

D-0911

Mechanism of protraction for liraglutide, the once-daily human GLP-1 analog

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Liraglutide is a once-daily human GLP-1 analog that has been developed for the treatment of type 2 diabetes and obesity. Liraglutide has a unique structure with a simple fatty acid and a spacer attached covalently to the peptide backbone (C16-gamma-Glu-Lys26,Arg34GLP-1(7-37)) that provides both delayed absorption and long plasma half-life. The mechanism for the protraction is based on app. 99% binding to albumin, providing the long plasma half-life, and heptamer formation in the formulation, providing a delayed absorption. Also, DPP(Di-Peptidyl Peptidase)-IV stability is obtained. We designed a series of analogs of liraglutide that provides insight into the mechanism of protraction by investigating the importance of the length of the fatty acid. The pharmacokinetic profiles were measured in pigs. DPP-IV stability was measured by mass spectroscopy. Binding to albumin was measured indirectly, by adding increasing amounts of albumin to a GLP-1 receptor binding assay. Multimer formation was assessed by circular dicroism spectroscopy. Decreasing the length of the fatty acid decreased half-life after s.c administration (16, 5.1 and 0.8h) and Tmax (7, 1.3 and 0.9h), as well as half-life after i.v. administration (10, 1.7 and 0.3 h) for liraglutide (C16), C11- and C10-analogs, respectively. Stability towards degradation by the DPP-IV enzyme correlated with the length of the fatty acid. The half-life for DPP-IV degradation in vitro was 2.4 min. for GLP-1, and 937, 383, 156 and 108 min. for liraglutide, C14-, C12-, C10-analogs, respectively. Binding to albumin decreased with the length of the fatty acid, measured as the shift in receptor activation by addition of 4% albumin (45, 45, 41, 14 for liraglutide, C14, C12, C10). The un-acylated analog did not bind to albumin. The apparent K_d for multimer formation in the formulations increased by decreasing fatty acid length. $K_{d,app}$ was <0.1 µmol/l for liraglutide, and 2, 10 and 50 µmol/l for C14, C12 and C10, respectively. In conclusion, the protraction mechanism for liraglutide includes albumin binding, heptamer formation and DPP-IV stability, resulting in delayed absorption and long plasma half-life, allowing once-daily dosing in humans.

Conflict of interest:
Stock ownership: Lotte Bjerre Knudsen, Per Franklin Nielsen, Dorte Bjerre Steengaard, Paw Bloch, Jesper Lau, Henrik Agersoe, all own employee shares in Novo Nordisk
Employee: Lotte Bjerre Knudsen, Per Franklin Nielsen, Dorte Bjerre Steengaard, Paw Bloch, Jesper Lau, Henrik Agersoe, all employees of Novo Nordisk

D-0912

Liraglutide, the once-daily human GLP-1 analogue, administered as monotherapy or SU combination over 52 weeks provides effective glycaemic control in Japanese patients with type 2 diabetes

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Aims: The efficacy and safety of the once-daily human GLP-1 analogue liraglutide was investigated in Japanese patients with type 2 diabetes (T2D) in two large Phase 3 trials.
Methods: Trial A: liraglutide 0.9 mg (*n*=268) vs glibenclamide (glib) 1.25–2.5 mg (*n*=139), both as monotherapy. Trial B: liraglutide 0.6 or 0.9 mg combined with an SU vs SU monotherapy (all groups *n*=88). Trials were 24-week double-blind, followed by 28 weeks unblinded.
Results: Trial A: After 52 weeks HbA_{1c} decreased from baseline by -1.48% with liraglutide vs -0.95% with glib (difference, -0.49%). Percentage reaching HbA_{1c} <7.0% was greater for liraglutide (36.9%) vs glib (18.2%). Trial B: HbA_{1c} decreased from baseline by -1.09% and -1.30% with liraglutide 0.6 and 0.9 mg, and by -0.06% with SU (difference: liraglutide 0.6 mg vs SU, -0.96%; liraglutide 0.9 mg vs SU, -1.37%). More patients reached HbA_{1c} <7.0% with liraglutide (0.6 mg: 30.6%, 0.9 mg: 56.8%) vs SU (6.8%). Mean PG and PG increments from FPG and 7-point profiles were lower with liraglutide in both trials. Beta-cell function (measured as pro-insulin/insulin and pro-insulin/C-peptide) was improved with liraglutide in both trials vs baseline. Liraglutide was weight neutral in both trials, despite improved glycaemic control. In both trials, more GI AEs were reported with liraglutide vs SU therapy in the first 4 weeks but were at comparator levels after week 4. No major hypoglycaemic events were reported. Trial A: 0.7 minor + symptoms only hypoglycaemic episodes/ patient year reported with liraglutide vs 3.8 with glib. Trial B: rates were similar with liraglutide 0.6 mg, 0.9 mg and SU (3.1, 3.7 and 3.0 episodes/patient year). However, from 24 to 52 weeks, rates with liraglutide were lower vs SU. In both trials, approx. 15% of liraglutide-treated patients developed liraglutide antibodies. Antibodies did not influence HbA_{1c}; mean decrease in both trials was similar in patients with antibodies vs. total cohort.
Conclusion: Once-daily liraglutide either as monotherapy or in combination with an SU provides effective and sustained glycaemic control without weight gain compared with SU therapy, in addition to low rates of hypoglycaemia. Both trials demonstrate improved beta-cell function with liraglutide in Japanese patients with T2D.

Conflict of interest:
Employee: Rasmussen, Katayama: Novo Nordisk.
Other substantive relationships: Seino: Novo Nordisk.

D-0913

Improvement in glycemic control and ß-cell function over 2 years with sitagliptin as monotherapy or add-on therapy to metformin in patients with type 2 diabetes

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Aim: To examine the effect of sitagliptin as monotherapy or as add-on therapy to metformin on measures of glycemic control and ß-cell function over 2 years in 2 pooled populations of patients with type 2 diabetes.

Table 1

Achievement of targets at 26 weeks								
	HbA_{1c}<7%				HbA_{1c}<7% + no weight gain + no hypoglycaemia			
	n	Proportion to target [95%CI]	OR for liraglutide 1.8mg vs comparator	OR for liraglutide 1.2mg vs comparator	n	Proportion to target [95%CI]	OR for liraglutide 1.8mg vs comparator	OR for liraglutide 1.2mg vs comparator
Liraglutide 1.8mg	1311	0.66 [0.62;0.70]	-		1216	0.42 [0.38;0.47]	-	
Liraglutide 1.2mg	866	0.58 [0.53;0.63]	1.41 (p=0.0022)	-	835	0.35[0.30;0.40]	1.38 (p=0.0047)	-
Rosiglitazone	226	0.35 [0.26;0.45]	3.59 (p<0.0001)	2.55 (p<0.0001)	223	0.06 [0.03;0.13]	11.15 (p<0.0001)	8.06 (p<0.0001)
Glimepiride	477	0.50 [0.43;0.57]	1.99 (p<0.0001)	1.41 (p=0.0175)	413	0.11 [0.08;0.15]	6.05 (p<0.0001)	4.37 (p<0.0001)
Glargine	225	0.54 [0.44;0.64]	1.67 (p=0.0118)	ND	189	0.15 [0.09;0.23]	4.22 (p<0.0001)	ND
Exenatide	196	0.47 [0.37;0.59]	2.18 (p=0.0008)	ND	159	0.27 [0.19;0.38]	1.96 (p=0.0067)	ND
Placebo	505	0.18 [0.14;0.23]	8.88 (p<0.0001)	6.30 (p<0.0001)	489	0.08 [0.06;0.12]	7.87 (p<0.0001)	5.68 (p<0.0001)
ND, not determined.								

Methods: For the monotherapy analysis, data from 2 clinical trials were pooled, and analyses were performed on the cohort of 147 patients not on an antihyperglycemic agent at screening and with a common baseline HbA_{1c} of 7.5%–10%. For the add-on to metformin analysis, data from 2 other clinical trials were pooled, and analyses were performed on the cohort of 852 patients on metformin =1500 mg/day and with a common baseline HbA_{1c} of 7%–10%. In each cohort, change from baseline in HbA_{1c}, fasting plasma glucose (FPG), HOMA-ß and proinsulin-to-insulin (P/I) ratio were analyzed over time (through 2 years). Additionally, 2-hour post-meal glucose (PMG) was analyzed in the monotherapy cohort. Data following initiation of an additional antihyperglycemic agent (used as glycemic rescue therapy in some studies) were treated as missing. Missing data were not imputed.
Results: For the pooled monotherapy cohort, mean baseline age was 53 years and duration of type 2 diabetes was 4.9 years. After 2 years, sitagliptin monotherapy decreased mean HbA_{1c}, FPG, and 2-hour PMG from baseline values of 8.5% (n = 147), 187 mg/dL (n = 147), and 261 mg/dL (n = 100) to 6.9% (n = 32), 132 mg/dL (n = 32), and 175 mg/dL (n = 32), respectively. HOMA-ß was increased from 47% (n = 103) at baseline to 69% (n = 36) and P/I ratio improved from 0.54 (n = 99) to 0.26 (n = 34) after 2 years with sitagliptin. For the pooled add-on to metformin cohort, mean baseline age was 56 years and duration of type 2 diabetes was 6.5 years. After 2 years, the addition of sitagliptin to ongoing metformin therapy decreased mean HbA_{1c} and FPG from baseline values of 8.0% (n = 852) and 173 mg/dL (n = 851) to 6.9% (n = 347) and 141 mg/dL (n = 345), respectively. HOMA-ß was increased from 47% (n = 730) from baseline to 61% (n = 357) and P/I ratio improved from 0.36 (n = 715) to 0.29 (n = 357) at 2 years. Treatment with sitagliptin was generally well tolerated over 2 years in each of the 4 clinical trials from which the pooled populations were drawn.
Conclusion: Substantial improvements in glycemic control and ß-cell function were observed with sitagliptin both as monotherapy and as add-on therapy to metformin in patients with type 2 diabetes over 2 years.

Conflict of interest:
Employee: Debora Williams-Herman - Merck employee
Thomas Seck - Merck employee
Gregory Golm - Merck employee
Honwei Wang - Merck employee
Jeremy Johnson - Merck employee
Keith D. Kaufman - Merck employee
Barry J. Goldstein - Merck employee

D-0914

Combination alogliptin plus pioglitazone treatment in patients with type 2 diabetes receiving metformin

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Aims: To assess the efficacy and safety of alogliptin (ALO) combined with pioglitazone (PIO) in patients with type 2 diabetes inadequately controlled on metformin monotherapy.
Methods: Treatment arms in this randomized, double-blind, placebo-controlled, 26-week study were placebo, ALO alone (12.5 or 25 mg qd), PIO alone (15, 30, or 45 mg qd), and the combinations of each ALO dose with each PIO dose. The primary analyses compared PIO monotherapy (all doses pooled; n = 387) with ALO 12.5 mg plus any dose of PIO (n = 390) or ALO 25 mg plus any dose of PIO (n = 390).
Results: Overall mean baseline A1C and BMI were 8.49%, 8.50%, and 8.54% and 31.1, 31.4, and 31.1 kg/m^2 for the PIO, ALO 12.5 + PIO, and ALO 25 +PIO groups, respectively. Decreases from baseline in mean A1C levels at Week 26 in subjects treated with ALO 12.5 + PIO or ALO 25 + PIO vs PIO alone were 1.43%, 1.42%, and 0.89%, respectively. In the overall analysis, each of the individual combination therapy arms had significantly greater efficacy at lowering A1C than either component monotherapy. When analyzed by subgroups of baseline A1C, subjects receiving either of the combination therapies achieved significantly larger decreases from baseline in A1C at Week 26 vs subjects receiving PIO alone (Table); in all 3 groups, subjects with higher baseline values had larger decreases. A significantly (P<0.001) higher percentage of subjects in both the ALO 12.5 + PIO (55%) and ALO 25 + PIO (56%) groups achieved A1C levels of ≤7.0% compared with PIO alone (30.5%). Indicators of pancreatic islet function, specifically HOMA ß-cell function, showed a statistically significant improvement in subjects receiving either combination therapy vs those receiving PIO alone (P<0.01). Some evidence of a synergistic effect was apparent with either ALO + PIO group vs PIO alone, particularly with ALO 25 + PIO; least squares (LS) mean changes from baseline in HOMA-ß were 5.1 for PIO alone, 18.2 for ALO 12.5 + PIO, and 22.2 for ALO 25 + PIO. The LS mean change in weight was 1.49, 1.81, and 1.87 kg for PIO alone, A12.5 + PIO, and A25 + PIO, respectively. Weight gain was not associated with peripheral edema. The percentages of subjects experiencing study drug-related AEs were similar across the treatment groupings: 19%, 20%, and 22% in PIO alone, ALO 12.5 + PIO, and ALO 25 + PIO, respectively. The percentage of subjects who discontinued the study due to AEs did not increase with combination therapy (ALO 12.5 + PIO, 2.1%; ALO 25 + PIO, 1.5%) vs PIO alone (2.8%).
Conclusions: ALO combined with PIO was well tolerated and produced statistically significant reductions in A1C compared with PIO alone.
Table. LS Mean Changes from Baseline at Week 26

	PIO alone	ALO 12.5 mg + PIO	ALO 25 mg + PIO
Baseline A1C <8.5%	-0.66% (n=196)	**-1.12% (n=188) <0.001***	**-1.08% (n=177) <0.001***
Baseline A1C >/=8.5%	-1.09% (n=180)	**-1.74% (n=197) <0.001***	**-1.74% (n=200) <0.001***
FPG, mg/dL	-28.3	-45.2	-44.2
HOMA-ß	5.1	18.2	22.2
HOMA-IR	-1.6	-2.2	-1.7

* vs PIO alone.

Conflict of interest:
Paid lecturing: Pratley: Speakers Bureau for Merck & Co., NovoNordisk, Takeda, and Novartis.DeFronzo: Speakers Bureau for Takeda Pharmaceuticals, Amylin, Eli Lilly & Co.
Stock ownership: Pratley: Novartis Pharmaceuticals. Mekki: Takeda Pharmaceutical Company, Ltd.
Advisory board: Pratley: Takeda Pharmaceuticals North America, GlaxoSmithKline, Novartis Pharmaceuticals, Roche, NovoNordisk.
Employee: Fleck, Mekki, and Wilson: Takeda Global Research & Development Center, Inc.
Commercially-sponsored research: Pratley: Takeda Global Research & Development Center, Inc., GlaxoSmithKline, Novartis, NovoNordisk, Merck, Eli Lilly & Co., Sanofi-Aventis. DeFronzo: Takeda, Amylin, Eli Lilly & Co., Novartis Pharmaceuticals, Bristol-Myers Squibb.
Other substantive relationships: Burant: Consultant to Takeda Pharmaceutical North America. DeFronzo: Consultant for Takeda, Amylin Pharmaceuticals, Eli Lilly & Co., Roche Pharmaceuticals, Novartis Pharmaceuticals, Bristol-Myers Squibb, Johnson & Johnson, and ISIS.

EDUCATION

Self-monitoring and awareness programs

D-0915

Problems in blood glucose self management among insulin treated diabetes patients in the context of non-adherence to recommended testing frequency

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Aims: Tight glycemic control is demanding in every day life of people with diabetes (PwD). Non-adherence to recommended self-monitoring of blood glucose (SMBG) is one of the consequences. The survey aimed to describe the level of non-adherence and identify problem areas that could be targets for improving adherence.
Methods: 150/152 structured telephone interviews with insulin-using PwDs were performed in the Netherlands (NL) / Denmark (DK). The questionnaire covered a broad spectrum of known barriers to proper insulin therapy and

SMBG - grouped into 11 categories. Patients were categorized into either flexible (they adjust insulin doses on their own) or fixed insulin therapy. Non-adherence (NAD) was defined in three ways: derived NAD (less frequent than recommended or self-rating NAD below 6 on a 1-7 rating scale (7=full adherence)) and guideline NAD (less than the 2009 ADA-guideline recommended frequency of 3 tests per day for patients on flexible insulin therapy). Shapley values were calculated to analyze the contribution of problem categories to SMBG non-adherence.

Results: Average age was 52.4/48.3 years with mean 15.4/12.7 years since diagnosis of diabetes. The overall satisfaction with diabetes management (top 3 points on 7 point scale) was 92/91%. Self-rated NAD with insulin therapy was 12 / 11%. 41/48% of PwDs in NL/DK were on Flexible insulin therapy, of which 41/33% are Guideline NAD. Among Guideline NAD, 60/54% test only once a day and 40/46% test twice a day. Derived NAD with SMBG was 39 / 30% (flexible) and 44/27% (fixed). The most prevalent problem with SMBG among insulin-using patients were test strip handling issues (88/82%), followed by time/situation (69/58%), educated decision making (47/25%), pain (45/35%), discreetness (40/26%), motivation (39/6%), coding (36/71%), safe waste-handling (31/30%), sense for need of testing (30/28%), cost (22/5%), glucose meter (17/18%).

Ranking of problems by impact on NAD (Shapley values, declining order): test strip handling, safe waste-handling, pain, time/situation, coding, educated decision making. The remaining categories scored distinctly lower.

Discussion: Optimal glycemic control with insulin relies on the adherence to recommended insulin injections and corresponding SMBG. Adherence to SMBG however is a challenge to a large share of patients – despite high satisfaction with diabetes management and good adherence to insulin therapy. Test strip handling (strip contamination, storage, temperature, expiry, etc.) and lifestyle alignment (time / situation) were most frequently mentioned problems. Differences between countries indicate that solutions need to consider specifics of health care systems and mentality as well.

Conflict of interest:
Commercially-sponsored research: Evans P, Antonow A, Weiner J - Roche Diagnostics

D-0916

Cost-effectiveness analysis of self-monitoring of blood glucose in patients with type 2 diabetes mellitus in a tertiary care hospital in Bangladesh

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Background & aims: Self-monitoring of blood glucose (SMBG) is considered a cornerstone of diabetes care and widely recommended. The cost-effectiveness of SMBG is still sometimes disputed and is controversial in a developing country. The study was taken to determine whether SMBG is associated with better glycemic control in patients with type 2 diabetes (T2DM) and whether it is economically cost-effective.

Methods: Four hundred T2DM patients were selected purposively, followed up in BIRDEM the central Diabetic Hospital in Bangladesh. Of them, 200 practiced SMBG regularly (visited 5 times) and other 200 were irregular (visited<2 times). In 1 yr follow-up, we ascertained a) the proportion performing SMBG b) SMBG frequency c) associates of SMBG use & frequency & $HbA1_c$ & d) SMBG cost.

Results: The Mean±SD age were 58±9 yrs and median $HbA1_c$ 7.5%. 30% were diet treated, 60% were taking OHAs & 10% were on insulin with or without OHA. There were no significant differences in fasting plasma glucose (FPG) or HbA_{1c} between the user groups at entry (P>0.001), but at the end FPG or HbA_{1c} found to be significantly higher in the group who didn't practice SMBG regularly (P=0.09). Patients were further divided into four groups based on frequency of testing:1) never (group 1, 9%), 2) less than one time per week (group 2, 21%), 3) one or more time per week and less than one time per day (group 3, 60%) & 4) one or more time per day (group 4, 10%). Univariate analyses of SMBG frequency showed in comparison with group 1, subjects in group 3 were younger (49.7 ± 7.3 vs. 63 ± 9.5 years; P=0.004), had shorter diabetes duration (median 2.9 [interquartile range 0.8-7 [1.4-10.0]; P=0.004), however, these patients also had a lower median HbA_{1c} (6.3 vs. 7.8%; P=0.001) and higher proportions exercised (8.2 vs. 6.1%; P=0.010), attended diabetes OPD (34.5 vs. 23.6%; P<0.001). The average annual cost per patient was US$ 172. A glucometer added US$ 50 per patient per year. SMBG costs for diet and OHA-treated patients were almost similar (US$ 141 & US$ 153 per patient, respectively, P=0.83) but lower than the US$ 221 for insulin-treated patients (P<0.001). The direct health care costs (excluding glucometer) averaged US$ 93 & US$ 252 for the regular & irregular SMBG user groups respectively. The 200 who attended five or more follow up were significantly younger, had shorter diabetes duration, better glycemic control, fewer diabetes complications (P<0.001). The proportion of the longitudinal cohort using SMBG increased over time (trend P<0.001), from 51% at entry to 67% at third follow up (P<0.001), before leveling off to 78% at fifth follow up (P=0.001 vs. baseline).

Conclusion: Intensive blood glucose control in T2DM patients, who used SMBG significantly initially increased treatment costs in a diminishing marginal rate but substantially reduced the cost of complications. Timely management by SMBG frequently was both clinically astute & cost effective.

No conflict of interest

D-0917

Evaluation of SMBG behavior models and the performance of continuous health education in diabetes

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Aims: Many studies have sought to evaluate whether the use of self-monitoring of blood glucose (SMBG) positively affects diabetic care in assessing glycemia. There are multiple sources of error including the population studied, the mode of treatments, durations of the trial, and study designs, all the issues affect the evaluation of conclusion in each trial. Aim of this study was to investigate the improvement of HbA1c in diabetic patients of more than 3 months intervention of SMBG with stable health educational control.

Methods: 164 patients (88 men, 76 women, 6 Type 1 DM, 158 Type 2 DM) were enrolled consecutively into the trial from December 2007 to December 2008. Subjects were followed up more than 3 months. Web-based TeleHealth System was provided for communication between subjects and physicians, and for management of blood glucose values. Primary outcome parameter was the change of HbA1c between baseline and follow-up end point. Primary outcome criterion was tested by a one-sided t-test for non-inferiority. Secondary outcome parameters were other metabolic markers as total cholesterol, triglyceride, LDL, HDL and creatinine. The daily frequencies and measuring time points were also recorded and analyzed.

Results: There are no statistical differences in the 164 subjects for demographic parameters and drug treatments. However, significant difference was demonstrated for the primary outcome in the change of HbA1c and the mean HbA1c for enrolled subjects was improved from 7.64±1.31 to 7.38±1.26 (P = 0.045). There were no statistically significant differences for all secondary metabolic markers. The distribution of average daily frequencies for the use of SMBG was 25% for 1 time/day, 46% for 1-2 times/day, 19% for 2-3 times/day, and merely 10% for 3-6 times/day. The distribution of pre-meal measuring time points was 29.18% before breakfast, 18.78% before lunch, and 25.98% before dinner. The distribution of post-meal measuring time points was 26% after breakfast, 21.77% after lunch, and 40.66% after dinner. Obviously, the most available times for measuring blood glucose are before breakfast and after dinner, and it indicated that patients preferred to measure blood glucose at home rather than outside such as work place. Some patients were concerned if colleagues or friends knew about his diabetes and would influence the social relationship or work performance.

Conclusion: SMBG is good method to allow diabetic patients to relate events in their daily life and treatment regimen to glycemic results. Frequencies for the use of SMBG vary directly with the intensity of treatment, and the consistent communication between diabetic patients and physicians is essential to effective implementation of self-monitoring and maintenance of patient motivation. Our study indicates that intensive care in using SMBG is necessary for the improvement of glycemia.

No conflict of interest

D-0918

Effect of SMBG-based Diabetes Self-Management Education (DSME) on glycemic control in type 2 diabetes with oral antidiabetic agents

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Backgrounds: The goal of Diabetes Education is to optimize metabolic control. Self-monitoring of blood glucose(SMBG) is an important educational tool for achieving glycemic control. The aim of the study was to evaluate the effect of self-monitoring of blood glucose(SMBG)-based Diabetes Self-Management Education(DSME) on glycemic control in type 2 diabetes with oral antidiabetic agents
Methods: This study was designed to compare changes in glycemic control in SMBG-based DSME group(n=65) versus control group(n=65). Data were obtained from medical records of type 2 diabetic patients treated with oral antidiabetic agents and HbA1c $\geq$ 7.0% who received their education at a samsung Medical diabetes center in Korea from June 2006 to June 2007. All participants completed Diabetes Self-Management Education(DSME) defined as informational intervention of lifestyle habits and reinforcement of educational Monthly News letter delivered by the diabetes nurse educator. SMBG-based DSME group requested to measure blood glucose 7 times a day for a week and to record their diary and received counseling with a focus on diet and lifestyle during the education. Assessments were conducted baseline, 3, 6 and 12 months. HbA1c was used as an index of glycemic control.
Results: Baseline of HbA1c was not different between the SMBG-based DSME group and control group (SMBG-based DSME group 8.34± 1.53% vs. control group 7.82± 0.83%). 12 months later, the level of HbA1c was reduced by 1.28±1.68% SMBG-based DSME group(end point 7.07± 0.91%) and 0.49±1.05% in the control group(end point 7.34±1.12%) and achieved the goal of glycemic control (IDF goal: HbA1c< 6.5%) (SMBG-based DSME group 27.69% vs. control group 20.0%). A repeated measures analysis of variance was also carried out on the four values (at baseline, 3 months, 6 months and 12months) and found a significant decrease in HbA1c level over time(P<0.0001), a significant effect of Time* Group interaction (P =0.0128), but no significant effect of group.
Conclusion: SMBG-based DSME for patients with type 2 diabetes with oral antidiabetic agents was effective in improving glycemic control and maintaining long-term glycemic control.

No conflict of interest

D-0919

Self-monitoring of blood glucose improved both the glycaemic control and 10-year coronary heart disease risk profile of Afro-Caribbean type 2 diabetic patients in Trinidad and Tobago

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Background and aim: The debate on the overall benefits of self-monitoring of blood glucose in type 2 diabetic patients is still continuing. We assessed the difference in glycaemic control and coronary heart disease (CHD) risk levels of Afro-Caribbean patients provided with facilities for self-monitoring of blood glucose and their counterparts without such facilities.
Methods: Sixty-one patients who had no prior experience in using glucometers were studied as intervention (n=30) and control (n=31) groups. The intervention group was trained on self-monitoring of blood glucose and documentation. At baseline, blood pressure (BP), anthropometric indices and fasting blood glucose of all patients were measured. Subsequently, the intervention patients were provided with free glucometers, testing strips and advised to self-monitor their fasting and postprandial blood glucose every other day for six months. The 10-year CHD risk levels were determined with the United Kingdom Prospective Diabetes Study-derived risk engine calculator.
Results: The age, diabetes duration, BP and anthropometric indices were similar in the two groups (all, p>0.05). The majority of the patients were unemployed or retired females with only primary education. After three months, the HbA1c levels of the control patients remained unchanged (7.8±0.3 vs. 7.9±0.4%, P>0.05) whereas the HbA1c levels of the intervention patients reduced significantly from the baseline at three (9.6±0.3 vs. 7.8±0.3%, p<0.001) and six (9.6±0.4 vs. 7.5±0.3%, p<0.001) months. Interestingly, while the 10-year CHD risk level of the control group remained unchanged after three months, that of intervention group was remarkably reduced from the baseline level at three and to nearly one half after six months (7.4±1.3 vs. 4.5±0.9%, p<0.05).
Conclusion: Provision of facilities for self-monitoring of blood glucose in Afro-Caribbean type 2 diabetic patients significantly improved both their glycaemic control and CHD risk profile. Type 2 diabetic patients of African origin will benefit from inclusion of glucose meters and testing strips in their health care package.

No conflict of interest

D-0920

The self-measurement of home blood pressure contributes to controlling mean clinic blood pressure levels below 130/80 mmHg in diabetic-hypertensive patients with their agreement

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Background and aims: We treat approximately 900 outpatients/month, of whom 79% have diabetes, and 47% of them have hypertension. The clinic BP in outpatients has been significantly decreasing in recent years. The mean clinic BP was 129 /70 mmHg in 2003 and 123/68 mmHg in 2007 (unpaired t-test vs 2003, p<0.001). This is assumed to be attributable to the fact that we have been strongly recommending patients to measure home BP. In recent years, most patients have measured home BP and tried to control it.We investigated the effect of the self-measurement of home BP.
Materials and methods: We lent BP monitors and recorders to patients who had discontinued or had not undergone hypertension treatment. The data they measured by themselves was accumulated in PC. Referring to data on morning BP, we selected an antihypertensive drug or increased its dose each time when they visited clinic, with the objective of achieving an optimal BP of 125/80 mmHg or a target BP of <135/85 mmHg. We also instructed the remaining diabetic patients concomitantly having hypertension to measure home BP using their own BP monitors and record it in their notebooks (notebook-using patients). We tried to control their BP, referring to results when they visited. To achieve the same target BP, all the hypertensive patients were required to measure home BP in the morning and evening. The data accumulated in PC was reported to each patient.
Results: The study started from 2002. 33 diabetic patients (14 male, 42%) could accumulate data for 6 months or longer. A comparison of patients backgrounds between the HOMED-BP study and notebook-using (257) was - age: 58±8 / 65±10 years respectively (vs. HOMED-BP study, p<0.0001); BMI: 26±5 / 25±4 kg/m^2 (p=0.2196); diabetes treatment duration: 8±8 / 10±8 years (p=0.0491)(Mean±SD); current clinic BP: 122±14/68±8 and 128±14/68±10 mmHg (p=0.0202 and p=0.6674) (clinic BP at the start of the study: 156±15 /88±12 mmHg; and morning BP: 157±12 /91±10 mmHg); and the number of antihypertensive drugs used: 3±1 and 1.8±0.8 (p<0.0001).
Conclusion: When anti-hypertensive medications were administered to diabetic patients with hypertension in reference to home BP data, the target attainment rates of both home and clinic BP largely increased.This suggests that if physicians select an appropriate anti-hypertensive medication and control its dose, referring to home BP, it is possible to decrease BP in many diabetic patients with their agreement. Hypertension may cause macroangiopathy, including myocardial infarction and cerebral infarction, and worsen diabetic retinopathy and diabetic nephropathy. However, it is very difficult for all people with diabetes to achieve these targets, and the target attainment rate in Japan is not high.The self-measurement of home BP does not put any burden on patients, excluding the purchase of BP monitor, so it is assumed to greatly contribute to medicoeconomics.

No conflict of interest

D-0921

Variation of capillary glycemia and blood pressure of people with type 2 diabetes after joining a program of physical activity for diabetes

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Aims: To observe the changes in capillary blood glucose and blood pressure of type 2 diabetic individuals of both sexes, after entering a program of physical activities geared to diabetics.

Methods: The program is assisted by a team in the areas of exercises, education, nutrition, medicine, nursery. The activities consisted of monitoring 3x per week, in the afternoon, with 2h in duration each, where in each meeting, the self-monitoring of blood glucose is done in a fed state. Activities included physical monitoring, lectures, and guidelines on treatment. We analyzed 22 type 2 diabetic individuals aged average of 56±9 years and average time of diabetes diagnosis 9±6 years, requiring a minimum presence of 60% in the activities of the program (30 lessons) and correct completion of the chips. To measure capillary blood glucose were used glucometers (One Touch and Roche) under the observation of monitors, and measurement of systemic blood pressure (SBP) was performed by trained personnel with the columns of mercury sphygmomanometers. We collected the data of glycemia and SBP to compare results. To compare the variables was applied paired student t-test with significance level $p<0.01$. All subjects gave written informed consent. This investigation was approved by the institutional review boards of the University of Brasília, Brazil.

Results: There were no significant changes in relation to SBP, comparing both the systolic and diastolic separately (both p=0.27), average initial and final 131/82mmHg and 133/80mmHg. Glycemia was significantly reduced ($p = 0.007$). The mean initial blood glucose was 177±99mg/dl, decreasing to 144±35mg/dl at end of program, totaling an average decrease of 33 mg/dl which represents 18.64%. There was 3 people with higher loss of 100mg/dl, and the maximum was 312mg/dl.

Discussion/conclusion: It is known that poor of glycemic control is an important predictor of many chronic complications of diabetes mellitus, and strategies for changing behavior are fundamental to the improvement of the metabolic system. Education programs in diabetes assume paramount importance in the work of awareness in the treatment of disease. More research is needed to develop interventions effective in maintaining long-term glycemic control.

No conflict of interest

D-0922

Diabetes prevention and control: public education initiatives in the U.S.

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The National Diabetes Education Program is a government funded program sponsored by the U.S. Department of Health and Human Services. NDEP has over 200 partner organizations that work at national, state and local levels. NDEP was established to improve diabetes awareness and control in the U.S. in 1997. In 2001, based on the results of the Diabetes Prevention Program (DPP), NDEP added a diabetes prevention initiative.

NDEP develops and implements evidence-based public education initiatives by translating clinical research into effective public education messages, materials and campaigns. NDEP conducts quantitative and qualitative research. Results of the NDEP 2006 and 2008 public surveys provide information on public awareness of factors influencing diabetes awareness, diabetes control and influences on one's perception of risk for diabetes. Qualitative research done through the use of focus groups with targeted populations is used for guiding program development. All program components are subject to evaluation, and are updated with new evidence.

Addressing health disparities is a core goal of NDEP. Core materials are adapted for up to 20 audiences. Resources are also age appropriate, with an emphasis on children, adolescents and older adults and their families.

NDEP's Control Your Diabetes. For Life. campaign focuses on providing, and the importance of, comprehensive diabetes care. The campaign was based on the findings of the Diabetes Control and Complications Trial and is updated regularly. This campaign includes resources for consumers, families and health care professionals.

NDEP's diabetes prevention campaign, Small Steps. Big Rewards. Prevent Type 2 Diabetes, is designed to reach the 57 million Americans at risk for diabetes and is based on the intervention used in DPP. Resources include a toolkit for healthcare professionals to help consumers with lowering their risk through lifestyle changes and modest weight loss, and community guides for implementing prevention programs for various audiences.

Findings from recent clinical trials and new clinical standards will be summarized and how these results are changing the NDEP public education initiatives will be presented.

A new initiative, Support Behavior Change, is focused on helping with the behavior/lifestyle change efforts of people with diabetes and at risk for diabetes, and their families. It will also support health care providers and organizations in helping those who want to change their behavior. NDEP is assembling an inventory of existing and useful tools and programs that target various behaviors.

No conflict of interest

D-0923

Using a participatory process to enhance effectiveness of diabetes awareness campaign in the Philippines

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Introduction: The call to action on diabetes resonates around the world as late diagnosis of diabetes continues to challenge diabetes management. Response to this global call can be enhanced with the use of the community-based participatory process through the P-Process steps in strategic health communications. This has been widely used in family planning, maternal health, child survival, HIV/AIDS, and other infectious diseases such as malaria and tuberculosis. The Handicap International team in the Philippines believes that the same planning approach can be applied to a non-communicable disease like diabetes to initiate positive change in an effective and culturally acceptable manner.

Objective: To determine the benefits of a community-based participatory process in enhancing the effectiveness of a diabetes awareness campaign in the Philippines.

Methods: The process began with the joint analysis of the situation and the audience through dialogues with the partners and focus group discussions with persons at risk of developing diabetes. To develop the strategic design, a multi-stakeholder working group was organized with group members coming from health professionals, community health workers, people with diabetes, communication specialists and professional artists. Together, a strategy was built; messages and materials on screening were further developed and then pretested. To implement the campaign, community health workers underwent capacity-building workshops and action planning sessions.

To measure the results of the campaign, the numbers of screened patients were counted from the screening registries in the community health centres. After five months of implementation, strategies were improved.

Results: Practice-based evidence on the effectiveness of community-based participatory strategy for diabetes awareness campaigns: a step-by-step road map that allows stakeholders to work together on a campaign with measurable impact on the target audience.

Increase by 60% in the number of people who availed screening services in the project areas between the first and second half of 2008.

Conclusions: With many stakeholders on diabetes education who popularize the symptoms of diabetes and healthy lifestyle, a community-based participatory process is effective in identifying interventions where scarce resources can be appropriated and wasteful duplication of efforts reduced.

The added value of this process is that it also facilitated quality partnership building and enabled local partners to have a sense of ownership of the project. Local ownership is critical to sustainability of community-based interventions.

No conflict of interest

D-0924

Barriers to healthy behaviors for people with type 2 diabetes: what role do patient out-of-pocket costs play?

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Published US research shows that patient compliance with recommended healthy behaviors is greater when external funding sources reduce out-of-pocket costs (OOPC) for diabetes supplies, and is associated with improved health outcomes. However, for people with diabetes, research was not identified that directly investigated the influence of financial barriers on healthy behaviors in largely publicly funded healthcare systems.

Aims: This current research project investigates patients' financial barriers associated with diabetes care in a Canadian setting in order to determine the influence of these barriers on healthy behaviors.

Methods: We conducted in-depth face-to-face interviews with 14 adults (25-73 yrs; 57% female) from the Hamilton, Ontario area, with type 2 diabetes (diagnosed at least one year earlier). Detailed questions were asked about OOPC and the respondents' compliance with the following recommended health behaviors: exercising regularly; healthy eating; attending family physician and specialist visits; glucose monitoring; and medication compliance. A 10-point Likert scale was used to quantify respondents' perceptions of the impact of OOPC on these behaviors, with 0 being not at all and 10 being severe.

Results: Thirty-six percent of respondents reported moderate to severe financial barriers to complying with recommended healthy behaviors (rating 5-10). Those respondents who reported these higher scores for financial barriers typically had either no or inadequate financial coverage through employer-sponsored or public programs. We observed that the majority of our sample population (64%) found financial barriers associated with patient OOPC of minimal concern (ratings of 1-4). However, some individuals provided detailed commentary raising concerns about their inability to continue these health behaviors in the absence of existing external financial support.

Conclusion: Respondents stated financial barriers are associated with the magnitude of OOPC, and typically these costs are mitigated by both employer-sponsored and publicly funded programs for diabetes care. This highlights the importance of these funded programs and the risks associated with their retrenchment. Future research that explicitly considers the impact of a loss of external financial support on patients' healthy behaviors may prove to be an important adjunct to the existing research on OOPC and its relationship to health outcomes.

No conflict of interest

FOUNDATION SCIENCE

Insulin insensitivity and the metabolic syndrome

D-0925

Activation of lysosomes by intracellular triacylglycerol accumulation contributes to the increased oxidative stress in liver in NAFLD

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Aims: Hepatic steatosis represents a risk factor for the development of serious complications. This study was designed to test the hypothesis that processes associated with intracellular TAG cycling contribute to increased susceptibility of fatty liver to further stress factors. Special attention was paid to the regulation of TAG breakdown.

Methods: Hepatic steatosis was induced by 2-week high-fat diet (HFD, 69 cal% as lard) administration to male Wistar rats (300±15 g). Individual lipases were identified according to their pH optimum. Phagolysosome (PhL) fraction was prepared from liver homogenate by differential centrifugation. mRNA expression was measured by RT-PCR. LAL protein expression was quantified by immunodetection.

Results: Lysosomal lipase (LAL) was the only lipase that was able to cleave endogenous liver TAG. LAL activity was regulated according to the nutritional status at the level of mRNA synthesis (fasting 33.6±7.3; fed state 6.8±0.9 pg cDNA/ml). Beside this, in the situation of intracellular TAG accumulation we described an additional mechanism of LAL activation independent of mRNA or protein synthesis. LAL is functional only in lysosomes activated by substrate ingestion (PhL) that can be separated by centrifugation. In fatty liver the increased amount of intracellular fat droplets makes their contact with lysosomes more frequent and the probability of PhL formation increases. In accordance with this presumption we found an increased LAL activity (11±1 vs 29±4 nmol FFA.mg^{-1}.60 min^{-1}) and protein expression (4,5±1 vs 11,2±1,2 arb. units) in phagolysosomal fraction in HFD group. Moreover, the PhL from fatty liver exhibited increased fragility measured by the release of lysosomal glucuronidase (GU) into cytosol *in vivo* (33±2 vs 60±6 μmol.mg^{-1}) and during incubation *in vitro* (5,4±0,9 vs 13±2,2 μmol.mg^{-1}). Indicators of oxidative stress were significantly higher in homogenates from fatty liver (CD 31.5±1.2 vs 41.5±1.8 nmol.mg^{-1}; TBARS 1.4±0.1 vs 2.1±0.25 nmol.mg^{-1}; GSH 15.5±0.9 vs 11.5 μmol.mg^{-1}). Dexamethasone (5 mg/kg per day, 4 doses) significantly increased TAG accumulation in liver, depressed LAL activity (8.5±0.08 nmol FFA.mg^{-1}.60 min^{-1}), decreased fragility of lysosomes (GU release *in vivo* 12.8±2.3; *in vitro* 5.6±1.1 μmol.mg^{-1}) and ameliorated oxidative stress parameters (TBARS: 0.89±0.1 nmol.mg^{-1}).

Conclusion: In steatosis degradation of liver TAG realised by LAL is stimulated and requires formation of phagolysosomes. It may contribute to the alterations in mitochondrial function (described in steatotic liver) via 1) supplying excess of fatty acids for oxidation and 2) deterioration of mitochondrial membrane by released lysosomal enzymes, both resulting in increased ROS production. The importance of alterations of lysosome "state" induced by TAG accumulation in liver in the induction of oxidative stress is supported by the effect of dexamethasone.

No conflict of interest

D-0926

The effect of telmisartan on insulin-stimulated selected plasma adipocytokine levels in patients with metabolic syndrome

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Aims: Telmisartan is suggested as modulator of lipid and glucose metabolism. The underlying mechanisms are still unclear. The aim of our study was to test the effect of telmisartan (T) on selected plasma adipocytokine concentrations during acutely-induced hyperinsulinemia.

Methods: 12 patients with impaired glucose tolerance or impaired fasting glucose were enrolled in randomized, placebo-controlled, cross-over study of 3 weeks treatment with telmisartan (160 mg/d) or placebo (P). At the end of each treatment period the glucose disposal rate (M) was estimated by one-step hyperinsulinemic euglycemic clamp (120 minutes; 1 mU.kg $^{-1}$.min $^{-1}$; 5 mmol/l). Before and during the clamp (0, 120 minutes) plasma levels of fatty acid binding protein (A-FABP), high-molecular adiponectin (HMW), total adiponectin, visfatin, retinol-binding protein (RPB-4) were evaluated by ELISA.

Results: Compared to placebo, treatment with T increased insulin-stimulated total adiponectin concentrations during the clamp ($p<0.05$), however basal concentrations have not been changed. T has no effect on HMW adiponectin, A-FABP, visfatin and RPB-4. We have not found effect of T on insulin sensitivity, M was comparable between T and P periods.

	T		P	
Time	0 min.	120 min.	0 min.	120 min.
Adiponectin (ug/ml)	6,53±0,8	7,51±0,9	6,41±0,8	6,01±0,9
HMW adiponectin (ug/ml)	3,55±1,8	3,59±1,9	3,64±2,4	3,25±2,1
Visfatin (ng/ml)	8,48±8,5	8,51±5,4	8,40±7,9	9,34±10
A-FABP (ng/ml)	22,8±10	22,27±9	24,15±10	25,31±12
RBP- 4 (ug/ml)	44,26±20	39,24±23	43,30±17	39,77±15

Conclusion: We conclude that 3-week intervention with telmisartan increases plasma total adiponectin during acutely-induced hyperinsulinemia, while HMW adiponectin, visfatin, A-FABP and RPB-4 are not affected. The results support the hypothesis, that the increase in plasma adiponectin might be involved in the metabolic effects of telmisartan in patients with metabolic syndrome. (IGA *NR9359-3/2007).*

No conflict of interest

D-0927

Deletion of adipose differentiation related protein (ADRP) prevents lipid accumulation in knockout mice

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All cells package neutral lipids (triacylglycerol and cholesterylesters) in storage droplets surrounded by a phospholipid monolayer into which are embedded at least one member of the PAT protein family (perilipin, ADRP, Tip47, S3-12 and LSDP5). These proteins serve to protect the lipid contents from lipases and thus, sequester fatty acids which may induce insulin resistance. The lipid droplets are essential for storage of lipids utilized for cellular energy, membrane synthesis and steroid production. Excessive cellular triglycerol storage is commonly associated with obesity and it is a well-known risk factor in the development of obesity-related metabolic complications such as insulin resistance, type 2 diabetes, cardiovascular disease, and abnormal lipid metabolism. Perilipin is a well-characterized member of the PAT family proteins, with expression largely limited to adipose cell whereas other PAT proteins such as ADRP are ubiquitous. The objective of this study was to generate an ADRP knockout mouse. To our knowledge, this is the first mouse model of an ADRP knockout mouse. Chan et al. reported inactivation of part the ADRP gene in mice that exhibited a limited phenotype with only marginal reduction of hepatic lipids, but there was no effect to the plasma lipid profile, adipocyte differentiation, and fat mass. By contrast, our ADRP knockout mouse exhibits a total lack of ADRP, and a dramatically reduced (by 30%) fat mass such as epididymal and inguinal fat pads ($p<0.001$). A better understanding of the molecular pathophysiological mechanisms of lipid droplet-associated proteins with functional links to metabolic complications can lead to the discovery of new therapeutic molecular targets for the treatment of metabolic disorders.

No conflict of interest

D-0928

Acute angiotensin II type 1 receptor blockade induces an increase in adiponectin in healthy subjects

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Background and aims: Decreased adiponectin concentrations in metabolic syndrome and diabetes are widely acknowledged. Angiotensin II type 1 receptor blockade is supposed to enhance insulin sensitivity. However the underlying mechanisms, eg. effect on adiponectin levels, have not been clarified in humans till now. The aims of our study were: a) to assess plasma concentrations of total and high-molecular weight (HMW) adiponectin and its expression in subcutaneous adipose tissue and b) to evaluate their responses to acutely induced hyperinsulinaemia and angiotensin receptor blockade in healthy subjects.
Methods: 12 healthy men underwent: 1) hyperinsulinaemic (1 $mU.kg^{-1}.min^{-1}$) euglycaemic (5 $mmol.l^{-1}$) clamp (HEC); 2) HEC after administration of losartan 200 mg (AT-HEC) and 3) saline 0,9% infusion as a volume control (SAL). At baseline (0 min) and at the end of the particular intervention (240 min) blood samples were taken for assessment of total and HMW adiponectin in plasma (HEC/AT-HEC/SAL) and a needle biopsy of abdominal subcutaneous adipose tissue (HEC/AT-HEC) was performed. Tissue samples were further processed for real-time PCR to estimate relative expression of adiponectin.
Results: Insulin sensitivity estimated as metabolic clearance rate of glucose (MCR) was not influenced by angiotensin receptor blockade (HEC vs. AT-HEC: 10.81±0.77 vs. 11.46±1.16 $ml.kg^{-1}.min^{-1}$; ns). Plasma concentrations of HMW adiponectin declined during both HEC and SAL ($p<0.05$; ANOVA), changes in total plasma adiponectin during HEC and SAL were not significant. Compared to other interventions, during AT-HEC significant increases in both total and HMW adiponectin were detected ($p<0.05$; resp. $p<0.01$; ANOVA). Relative expression of adiponectin in subcutaneous adipose tissue did not show any changes during HEC, whereas during AT-HEC an increase in expression was observed ($p<0.05$; ANOVA).
Conclusion: The increase in total and HMW adiponectin, as well as its increased expression after acute losartan administration, might represent one of the mechanisms by which the angiotensin receptor blockade influences insulin sensitivity. Acute hyperinsulinaemia had no significant impact on plasma adiponectin or its expression. The decline in HMW adiponectin during hyperinsulinemia can be explained by haemodilution during the clamp. Table: Plasma concentrations of total and HMW adiponectin and its relative expression (adiponectin mRNA/cyclophilin mRNA). Data expressed as mean±SEM.

p-adiponectin [µg/ml]	HEC		AT-HEC		SAL	
	0 min	240 min	0 min	240 min	0 min	240 min
Total	4.87±0.46	5.35±0.47	5.51±0.47	6.25±0.52	5.70±0.49	5.91±0.63
HMW	4.05±0.42	3.82±0.42	4.44±0.39	4.76±0.50	4.34±0.60	4.08±0.53
Adiponectin rel. expression [AU]	HEC		AT-HEC			
	0 min	240 min	0 min	240 min		
	18.98 ±2.21	19.16 ±2.44	21.68 ±1.56	20.50 ±2.91		

No conflict of interest

D-0929

Combined effects of atorvastatin and metformin on glucose-induced variations of endothelial function in patients with newly diagnosed diabetes mellitus

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Aims: Statin treatment has been suggested to improve survival in patients with atherosclerosis, but their effects on the glucose-induced variations of endothelial function are unknown.We examined the effect of atorvastatin when administered on top of conventional anti-diabetic treatment or diet, on glucose-induce variations of endothelial function, in patients with newly diagnosed diabetes mellitus type 2 (DM).
Methods: Seventy subjects with newly diagnosed DM were randomised to receive metformin 850mg/d (M, n=17), metformin850mg/d+atorvastatin 10mg (M+A, n=16), atorvastatin 10mg/d with dietary instructions (A+D, n=18) or diet only (D, n=19). All subjects underwent glucose loading (75g oral glucose) at baseline and after 12 weeks of treatment. Blood samples were obtained at baseline and 3 hours post-loading, while endothelium-dependent dilation (EDD- by gauge-strain plethysmography) was evaluated at baseline and every 1h.
Results: At baseline, EDD was reduced after glucose loading in the overall population (from 86.2±5.1% to 60.7±2.5% at 1h $p<0.001$ vs baseline, 54.7±2.3% at 2h $p<0.001$ vs baseline and 75.5±2.8% at 3h, $p<0.05$ vs baseline). Diet slightly prevented the glucose-induced reduction of EDD at 3h (from 80.4±7.1% to 63.2±4.7% $p<0.05$ at 1h, 62.0±5.0% $p<0.05$ at 2h and 76.2±6.5% p=NS at 3h). A similar effect was observed in M group (from 88.8±5.6% to 58.9±6.5% at 1h $p<0.001$, 52.6±4.8% at 2h $p<0.001$ and 75.4±3.6% at 3h p=NS). There was no benefit in A+D group (from 85.7±4.8% to 56.2±4.1% $p<0.001$ at 1h, 53.6±4.6% $p<0.001$ at 2h and 71.7±5.7% p=NS at 3h) or in M+A (from 73.3±4.7% to 62.2±3.6% $p<0.001$ at 1h, 55.6±5.6% at 2h and 55.6±5.6% p=NS at 3h).
Discussion/conclusions: Glucose loading significantly affects endothelial function. Three months treatment with atorvastatin alone or in combination with metformin failed to further improve the response of endothelial function.

No conflict of interest

D-0930

Role of stress in the development of type 2 diabetes mellitus

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Aim: To study whether chronic environmental stress is associated with abnormalties in Glucose tolerance, Insulin sensitivity and Pancreatic beta cell function.
Methods: Stress scale questionnaires - Presumptive Stressful Life Events Scale (PSLES), Perceived Stress Scale (PSS) and Sense of Coherence (SOC) - were administered to 232 Normal Glucose Tolerance (NGT) and 123 Newly Detected Diabetes Mellitus (NDDM) subjects. Study subjects were recruited on the basis of standard WHO criteria following a 75 gram oral glucose tolerance test (OGTT) conducted in 1921 apparently healthy subjects comprising relatives of diabetic patients and other healthy volunteers. Clinical parameters like body mass index (BMI), waist, waist hip ratio (WHR), systolic blood pressure (SBP) and diastolic blood pressure (DBP) were recorded in all. Fasting serum insulin and lipids were performed in all cases. Insulin resistance and ß-cell function were determined by the method of homoeostasis model assessment (HOMA). All parameters were compared in NDDM and NGT subjects in a case control design.
Results: All clinical (BMI, waist, WHR, SBP, DBP), biochemical (serum total-, high density lipoprotein-, low density lipoprotein-, very low density lipoprotein-cholesterol, and triglycerides) and insulin resistance (HOMA-IR) parameters were significantly higher and pancreatic ß-cell function (HOMA-ß) parameters were significantly lower in NDDM subjects as compared to NGT.
Stress questionnaire scores were significantly higher in NDDM subjects as compared to NGT ($p<0.05$) with respect to PSLES-lifetime (577.20± 146.67 vs 420.55±119), PSLES-1 yr (99.98±73.40 vs 41.26±44.12) as well as PSS (19.4±6.39 vs 12.22±5.64) indicating higher prevalence of stress in them. SOC scores (23.63±4.37 vs 25.60±4.70) were lower in the NDDM group suggesting that NDDM subjects did not cope as well as NGT subjects with stress.
Conclusion: The results of the present study indicate that NDDM subjects display higher chronic environmental stress and poor stress coping. It would appear that chronic stress leads to a higher central obesity, greater insulin resistance and Diabetes Mellitus.

No conflict of interest

D-0931

Evaluation of insulin resistance in first degree relatives of type 2 diabetes mellitus patients in population from Colombia

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Introduction: Family history of type 2 diabetes (DM2) is a major risk for DM2 in youth. We assessed the effect the variants in four genes with relatively small effects may contribute to the etiology of diabetes. Homeostasis model assessment (HOMA) is a method for assessing *B*-cell function and insulin resistance (IR) from basal (fasting) glucose and insulin.
Objective: To evaluate the impact of family history of DM2 on insulin secretion relative to insulin sensitivity in healthy youth and to assess the association between the polymorphisms ID 45 and -866G/A of the gene uncoupling protein 2 (*UCP2)*, -55C/T of the gene *UCP3*, -2548GA of the gene *Leptin* and SNP19 of the gene *Calpaine* in a Colombian population.
Methods: A total of 186 men and women aged 20-40 years with (60) and without (126) a family history of DM2. Enzymatic methods were used to measure glucose, total and HDL cholesterol and triglycerides in each sample. Serum insulin was measured by radioimmunoassay.
All participants were interviewed. The study comprised measurement of anthropometric parameters: weight, height, body mass index (BMI), blood pressure, waist and abdomen circumferences and waist to hip ratio. Each sample was genotyped for 5 polymorphisms in UCP 2 and 3, Leptin and Calpaine genes by PCR and PCR-RFLP.
Comparison between people with and without a family history of DM2 was made using two-tailed Student's *t* test for continuous variables. Pearson or Spearman correlation analysis was used. Single associations were evaluated by chi-square test. The IR, the state beta cell function (%B) and insulin sensitivity (%S) was calculated with HOMA v2.2.
Results: Cholesterol LDL (92 vs. 101 mg/dl, P= 0.033), waist circumferences (81 vs. 86 cm, P= 0.015), waist to hip ratio (0.81 vs. 0.84, P= 0.043), body mass index (22 vs. 26 Kg/m^2, P= 0.001), weight (63 vs. 69 kg, P= 0.009), plasma glucose (82 vs. 88 mg/dl, P= 0.001) and triglycerides (99 vs. 148 mg/dl, P= 0.001) were lower in people without versus with family history of diabetes. The alleles were in Hardy-weinberg equilibrium. The ID genotype subjects for ID45 (UCP2) had significantly higher fasting HDL cholesterol concentrations and so on in the GG genotype subjects for -2548GA (Leptin) had higher fasting total and LDL cholesterol concentrations and they had higher BMI; the DD genotype subjects for SNP 19 (Calpaine) had higher fasting total cholesterol and insulin concentrations.
Conclusion: Family history of DM2 is associated with alterations in metabolic parameters in youth with a positive family history, and suggests that many of the determinants are genetic. Some alleles of UCP 2, Leptin and Calpaine genes confer risk of DM2 in a Colombian population. The cut-off point for the homeostasis model (HOMA) was 1.8.

No conflict of interest

D-0932

The association between objective and surrogate measures of insulin sensitivity and beta cell function in adolescents

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Background: A reduction in both insulin sensitivity (Si) and the acute insulin response to a glucose challenge (AIR) precede the development of type 2 diabetes (T2DM). As direct measurements of these variables are labour intensive and associated with a risk of hypoglycemia, epidemiological studies of youth frequently rely on surrogate fasting or post-prandial measures to estimate Si and AIR. The aim of this study was therefore to assess the validity of surrogate measures of Si and AIR with direct measures in a cohort of adolescents with normal glucose tolerance.
Methods: We recruited 78 youth to participate in a cross sectional study of modifiable determinants of Si in youth, who were all screened for glucose tolerance. Si and AIR were assessed directly using Bergman's frequently sampled intravenous glucose tolerance test (IVGTT). Surrogate measures included a frequently sampled (15,30,60,90,120 min) insulin response to a two-hour 75g oral glucose tolerance test (OGTT) and the homeostasis model of insulin resistance and beta cell function (HOMA-IR and HOMA-B).
Results: We studied 65 overweight (BMI Z score: 1.9 ± 0.5) and 15 healthy weight (BMI Z score: 0.2 ± 0.6) adolescents aged 13-18yrs (mean 16± 2 yrs). Both HOMA ($r = -0.53$, $p < 0.01$) and OGTT-derived ($r = -0.52$, $p < 0.01$) measures of insulin sensitivity were significantly associated with IVGTT-derived values. In contrast, the disposition index was not associated with the insulin response at 15 and 30 minutes during an OGTT or HOMA-B. Variables that predicted Si and the area under the curve during an OGTT included percent body fat, waist circumference, hepatic triglyceride content and maximal oxygen uptake.
Conclusions: Surrogate estimates of Si obtained from fasting and frequently sampled OGTT are closely associated with values obtained from Bergman's IVGTT and may be considered useful for epidemiological studies of youth. In contrast surrogate measures of beta cell function from fasting or post-prandial insulin levels are less valid in adolescents.

No conflict of interest

Epidemiology

D-0933

Insulin resistance, body composition and energy expenditure in young, healthy rural South Indian males

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Introduction: Those born with low birth weight have a greater propensity to develop diabetes, a reason why glucose intolerance, insulin insensitivity & metabolic syndrome are increased in India.

Aims: To assess baseline characteristics of young rural South Indian males with low & normal birth weight on:

A. Insulin resistance as assessed by the hyperinsulinemic euglycemic clamp and other indices.

B. Body composition by DEXA and Bio-impedance.

C. Energy expenditure by indirect calorimetry & Actiheart.

Method: Subjects- 100, young rural males born at term from rural South India.

- Inclusion criteria: Healthy Males aged 18 to 22 years & fully attained puberty.
- Exclusion criteria: Diabetes, strenuous exercise, any medications, BMI >25 kg/m2, major organ disease.

Subjects are brought to hospital fasting & were examined. After informed consent, Anthropometry was assessed. Hyperinsulinemic euglycemic clamps combined with IVGTT & indirect calorimetry were done. Insulin secretion was measured using first phase insulin response. Insulinogenic index, M-value & disposition index were calculated. Resting and total energy expenditure were measured using indirect calorimetry and Actiheart. Body composition was measured using DEXA (Hologic).

Results: Analysis revealed: BMI: 19.13(±2.75), HOMA: 0.92(±1.16), 1/HOMA: 1.97(±1.44), QUICKI: 0.42(±0.06), McAuley's index: 11.33(±2.77). Glucose infusion rate during insulin stimulation (M value): 10.92(±3.78) mg/min/kg. Fat Free mass: 43.38(±5.39).

insulin sensitivity indicator (M value) correlated negatively with BMI(r: -0.28), waist circumference (r: -0.39), Total energy expenditure(r= -0.21), Total Cholesterol(r= -0.24), LDL(r= -0.26), Dry Lean weight(r= -0.27) and Truncal fat(r= -0.34).

Birth weight correlated positively with Basal (r=0.24 with p=0.008) and Activity associated energy expenditure(r= 0.17 with p=0.04).

Subjects were divided into quintiles on the basis of birth weight. Those with very low birth weight (VLBW<2kg) lagged behind in final height, compared to subjects with normal birth weight (NBW>3kg) [p=0.046]. Fat free mass assessed by DEXA was less in LBW subjects (2-2.2kg) compared with NBW subjects (p=0.029). Fasting insulin was higher in VLBW subjects compared to Borderline LBW (2.2-2.5kg) and NBW subjects (p values of 0.01 and 0.005 respectively).

Discussion/conclusion: This is the first study where indirect and direct determinations of body composition and insulin sensitivity were performed simultaneously in young lean healthy adult Asian Indians.

Insulin resistance indices were significantly related to glucose uptake, fasting insulin levels and the M-value being most tightly associated.

Data on energy expenditure obtained from the Actiheart indirect calorimetry showed a positive correlation between birth weight and energy spent.

Subjects in the lowest quintile had hyperinsulinemia more significant when compared those in the Normal and borderline low birth weight quintiles.

No conflict of interest

D-0934

What if everyone were Chinese? The convoluted effects of ethnicity on type 2 diabetes in Canada

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Aims: Canada's multi-ethnic make-up provides certain advantages when it comes to analyzing the effect of ethnicity on type 2 diabetes (T2DM). Canada represents not only a diverse set of racial groups, but also a Westernized obesogenic environment. This diversity makes it possible to directly compare the prevalence of type 2 diabetes among Caucasians and other major ethnic groups, controlling for BMI and other confounders.

Methods: Self-reported data from the 2003/04 and 2005/06 Canadian Community Health Survey were pooled to increase the sample size for subgroup stratification and restricted to those aged 40 years and older (n= 148,446). The unweighted sample included 127,315 Caucasians; 1,825 Blacks; 6,702 East and Southeast Asians; 1,718 Aboriginals; 3,202 South Asians; 866 West Asians and Arabs; and 836 Latin Americans. Those with physician-diagnosed diabetes were further verified to exclude gestational diabetes and possible type 1 diabetes using an algorithm previous developed by Statistics Canada. The adjusted odds ratios for type 2 diabetes, adjusted for various confounders such as age, sex, body mass index (BMI) and family income, were then examined using logistic regression with Caucasian ethnicity as the reference group. Measures of variance and statistical significance were determined using bootstrap estimation.

Results: Before adjustment, crude prevalence of diabetes by ethnicity showed 7.5% for Caucasians; 10.7% for Blacks; 6.8% for East and Southeast Asians; 12.7% for Aboriginals; 13.6% for South Asians; 3.3% for West Asians/Arabs; and 6.1% for Latin Americans in adults 40 years of age and over. Compared to Caucasians, odds ratios for diabetes, adjusted for age and sex, were 2.3 (95% CI: 1.9-2.8) for Aboriginals, and 2.3 (95% CI: 1.8-2.9) for South Asians. Adjusted for age, sex and BMI, odds ratios were 1.8 (95% CI: 1.3-2.5) for Blacks, 1.7 (95% CI: 1.4-2.1) for East and Southeast Asians, 1.9 (95% CI: 1.6-2.4) for Aboriginals and 3.0 (95% CI: 2.4-3.8) for South Asians.

Conclusions: Compared to Caucasians, the crude prevalence of self-reported diabetes is high among South Asians, Aboriginals and Blacks, but relatively low for East and Southeast Asians. After adjusting for confounders such as BMI and age, Chinese and other Southeast Asians have similar diabetes risk as Blacks and Aboriginals. South Asians were the ethnic group with the highest risk for type 2 diabetes, after controlling for confounding factors.

No conflict of interest

D-0935

HOMA does not identify insulin resistance in cohorts with a high prevalence of pre-diabetes: a study of Black Africans and African Americans

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Insulin resistance can be accurately determined from the insulin sensitivity index (S_I) with data from frequently sampled intravenous glucose tolerance tests (FSIGT). However, FSIGT are time consuming and expensive. As an alternative, homeostasis model assessment (HOMA) is an inexpensive way to measure insulin resistance. HOMA is calculated using the product of fasting glucose and fasting insulin. HOMA is founded on the principle that fasting insulin levels are increased in the presence of insulin resistance. However, ß-cell failure can lead to low fasting insulin levels. Therefore, in pre-diabetes, which is characterized by both insulin resistance and ß-cell failure, HOMA could be inappropriately low. Using S_I as the reference, our goal was to determine if HOMA accurately measures insulin resistance in a cohort with a high prevalence of pre-diabetes. Sixteen Black Africans (BA) (75% male, age 38±8y (mean±SD), BMI 27.2±3.8 kg/m^2) were matched by sex, age and BMI to 16 African Americans (AA). All pairs had oral glucose tolerance tests (OGTT) and FSIGT. Insulin resistance was measured by HOMA and S_I. ß-cell secretion was determined by the acute change in insulin response to glucose (AIRg) during the FSIGT. BA had a higher rate of pre-diabetes than AA. S_I did not differ between BA and AA, but BA had

lower HOMA and lower AIRg (Results in Table). In conclusion, S_I was similar for BA and AA, but HOMA was significantly lower in BA. Therefore, HOMA did not reflect insulin resistance in BA. The cause for the inappropriately low HOMA in BA appears to be ß-cell failure. Evidence of ß-cell failure in BA was their high rate of pre-diabetes and low AIRg. Our data suggest HOMA should be used with caution in cohorts with a high prevalence of pre-diabetes and ß-cell failure.

Metabolic Characteristics			
Variable	Black Africans	African Americans	*P*-Value
Pre-diabetes (%)	50	6	<0.05
S_I	3.81±1.88	3.54±2.51	0.96
HOMA	1.02±1.40	1.60±0.62	<0.01
AIRg	606±255	1130±960	<0.01

No conflict of interest

D-0936

Tea consumption is not associated with type 2 diabetes in a French cohort of 69,532 women: the E3N/EPIC cohort study

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Aims: Tea consumption is associated with a reduced risk for type 2 diabetes in some cohort studies, but this association has not been confirmed in others, and its effect on glucose disturbances remains inconclusive. We examined the long-term effect of tea consumption with incident type 2 diabetes in a cohort of French women.
Methods: The E3N Cohort Study included 69,532 French women, 41 to 72 years, without diabetes at baseline. Tea consumption was assessed in 1993, and we documented 1415 validated incident cases of diabetes during a mean follow- up of 11 years. Hazard ratios (HRs) for diabetes and 95% confidence intervals (CIs) were estimated for each category of tea consumption compared with no intake by using Cox proportional hazards regression models with age as the timescale, and simultaneous adjustment for potential confounders.
Results: At baseline, tea consumers were younger, leaner, more physically active. Consumption of tea was also positively associated with dietary fiber intake, and inversely associated with energy intake, fat intake, caffeine intake, and magnesium intake. Addition of sugar and milk decreased with increasing tea consumption. In age-adjusted models, the hazards ratio for diabetes in the highest category of tea consumption (=3 cups/daily) was 0.68 (95% CI: 0.58-0.80; $p < 0.001$) in comparison with no daily tea consumption. The inverse association was independent of multiple confounders [0.77 (0.65-0.89; $p < 0.001$)], but no longer statistically significant after further adjustment for body mass index as a time-dependent variable [0.89 (0.76-1.05, $p = 0.46$)].
Discussion/conclusion: Our data do not support a protective effect of tea consumption for diabetes. However, in the present study it was not possible to discriminate the type of tea consumed (green or black), and evidence suggests that different types of tea might play distinct roles on the risk of diabetes. Tea consumption was inversely associated with body mass index at baseline, which suggests that any potential protective effect of tea would be mediated by its impact on body weight. Further studies, discriminating the type of tea consumed are necessary to elucidate the role of tea on diabetes risk.

Conflict of interest:
Other substantive relationships: DSS received fellowship from FAPESP (2008/56557-5), Brazil

D-0937

Monogenic diabetes in Slovakia: results of a nation-wide survey

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Introduction: Monogenic forms of diabetes include up to 2 % of all diabetes cases, but the exact epidemiology is not known. Direct prevalence of monogenic diabetes (MDM) can be calculated only with help of a nation-wide diabetes registry. This is available for children with diabetes in some countries including Slovakia, and can be used for calculation of early-onset monogenic diabetes, i.e. neonatal diabetes. In case of MODY, the registries for adults are absent in majority of countries. Therefore, only the frequency of MODY subtypes can be calculated.
Aim: of this study was to establish the epidemiology of selected forms of MDM, particularly the prevalence of Permanent Neonatal DM (PNDM) and frequency of the Maturity Onset Diabetes of the Young (MODY) subtypes.
Methods: Prevalence of PNDM was calculated using the Slovak National Registry of children with diabetes and Slovak demographic data, and updated to the end of 2007. Patients with MODY were actively searched in the diabetes outpatient clinics throughout Slovakia, using the MODY clinical diagnostic criteria (Ellard et al, 2008). The relevant genes responsible for PNDM (KCNJ11, ABCC8 and insulin gene) and for MODY (genes for GCK, HNF1A, HNF1B and HNF4A) were analyzed using the direct sequencing technique in the UK (PNDM) and Slovakia (MODY), respectively.
Results: Based on Slovak National Registry, nine patients with PNDM were identified. The PNDM incidence in Slovakia reached 1 case in 209,566 live births. Seven living patients with PNDM have different etiology of their MDM (four have KCNJ11 mutations, two have insulin gene mutations and one an ABCC8 mutation). Since 2004, in 86 families (319 patients) fulfilling the clinical diagnostic criteria for MODY, 24 probands and 56 family relatives had a mutation in GCK gene; 21 probands and 29 of their family had a mutation in HNF1A gene, and in one family (2 pts) a mutation in the gene for HNF4A was identified. No HNF1B mutation carriers were found.
Conclusions: The true, registry-based prevalence of PNDM in Slovakia is 1 case to 209,566 live births. Of the MODY subtypes, the most prevalent are *GCK* mutations (28% of MODY), followed by HNF1A (24%) and HNF4A mutations (1%). MODY-X families account up to 47%. Following the international estimate for MDM (2% of all diabetes cases), in 324,914 patients with diabetes in Slovakia, more than 6,500 patients should have monogenic etiology of their diabetes. This is a great challenge for the health care system, as majority of them should undergo a pharmacogenomics driven change in treatment (i.e. switch from insulin to sulphonylurea and/or diet only).

Conflict of interest:
Other substantive relationships: This work was supported in part by research grants MZ.2005/15-NEDU-01, APVV-51-014205 and CENDO.

D-0938

Diabetes is a risk factor for cancer specific mortality

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Aims: The well-known mitogenic effect of insulin raised some questions about its influence on cancer risk. We investigate the diabetes impact on cancer specific mortality.

Methods: We included 25760 consecutive subjects, 46% males, attending "I. Pavel" Diabetes Center, Bucharest, Romania; inclusion date was the first diabetes consultation during 2001. The follow-up was based on diabetes receipts and yearly follow-up with National Death Registry until 31st December 2007. The primary end-point was cancer specific mortality based on death certificate (ICD10 coding). Age-standardized mortality rates (ASMR) using European Standard Population as reference and Cox regression analysis adjusted for diabetes duration at inclusion were performed to correct for age biases.

Results: The mean age at diabetes onset was 38.8±17.3 years in T1DM, 58.3±10.2 years in OAD-treated T2DM (T2DMo), p<0.001 vs T1DM and 53.1±10.8 years in insulin treated T2DM (T2DMi), p<0.001 vs. T1DM. The mean diabetes duration at inclusion was 11.5±9.2 years in T1DM, 5.4±6.3 years in T2DMo (p<0.001 vs T1DM) and 8.2±7.3 years in T2DMi (p<0.001 vs. T1DM). The mean age at death was 66.9±11.7 years in T1DM, 73.3±8.8 years in T2DMo (p<0.001 vs T1DM) and 70.7±9.3 years in T2DMi (p<0.001 vs. T1DM).

During 5.99±1.69 years of follow-up (154251 person-years) there were 1014 (3.9%) cancer specific deaths; cancer ASMR = 16.01‰ in T2DMo, 25.51‰ in T2DMi and 18.46‰ in T1DM. Cancer ASMR in 2004 (mid-follow-up) for general population of Bucharest (official data) was 10.79‰. Considering the high "dilution" of our subjects within general population (~2 millions) we calculated standardized mortality ratios: 1.48 in T2DMo, 2.36 in T2DMi and 1.71 in T1DM.

Adjusted Cox regression analysis showed a cancer mortality risk associated with age at inclusion (hazard ratio 1.055 95%CI 1.044-1.066, p<0.001), masculine gender (HR 1.366 95%CI 1.152-1.621, p<0.001 vs. females) and both T1DM (HR 1.845 95%CI 1.275-2.671, p<0.001, vs. T2DMo) and T2DMi (HR 1.626 95%CI 1.329-1.99, p<0.001 vs. T2DMo).

Conclusions: We confirm previous reports regarding higher cancer mortality associated with diabetes, especially in T2DMi and T1DM. Although adjusted Cox regression analysis showed a significant hazard ratio for T1DM (HR 1.8) and T2DMi (HR 1.6) compared with T2DMo, we can only speculate that this is due to insulin presence in the treatment or due to a more severe (beta cell) insulin deficiency.

No conflict of interest

D-0939

Dysglycaemia in an urban Fulani population of Nigeria

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The Fulani are a normally nomadic people known for covering great distances on foot with a resulting lean physique and presumably low risk for diabetes mellitus. However, with modernization some Fulani have adopted sedentary lifestyles, western diet and white collar occupations which are some of the risk factors for diabetes mellitus and related non-communicable diseases.

Objective: To determine the prevalence and correlates of dysglycaemia in an urban Fulani ethnic group of Nigeria.

Research design and methods: Three hundred and eighty-nine urban Fulani dwellers were recruited using a multi-stage sampling technique. Using a modification of the WHO STEPS instrument, information on socio-demographic and anthropometric data were obtained. Casual or fasting plasma glucose was obtained in all subjects while OGTT was performed in a randomly selected group of 48 subjects. Dysglycaemia or glucose intolerance was defined using WHO criteria as the presence of diabetes mellitus, impaired fasting glycaemia (IFG) or impaired glucose tolerance (IGT).

Results: Of the 389 subjects studied, 190 (48.8%) were females while 199 (51.2%) subjects were males (χ^2=5.43, p>0.05). The mean (SD) age of the sample population was 39.3 (14.2) years with the males [42.0 (13.8) years] being significantly older than the females [36.4 (14.1) years, p< 0.05]. The male subjects had significantly higher mean weight, height, waist circumference, WHR and blood pressures but the women had higher but not statistically significant mean BMI (p=0.108). Eighteen subjects (4.6%) had previously undiagnosed type 2 diabetes mellitus while 37 (16.9%) of the subjects who had FPG done had IFG. Of the 48 subjects who had OGTT, seven (14.6 %) subjects had impaired glucose tolerance. The mean (SD) age, BMI, waist circumference and blood pressures of subjects with dysglycaemia were significantly higher than those in subjects with normoglycaemia (p<0.05).

Conclusions: The study shows a high prevalence of over 15% of dysglycaemia in this urban Fulani population of Northern Nigeria, much higher than most previously reported rates from Nigeria. The major modifiable risk factors for dysglycaemia in this study was obesity. The results underline the need to increase public screening and to emphasize the value of lifestyle modification toward traditional African lifestyle.

No conflict of interest

D-0940

Mortality in type 1 diabetes mellitus in Moscow county

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Aim: of the study was to analyze life duration, life expectancy, survival rate and causes of death in patients with type 1 diabetes mellitus (T1DM) of Moscow county.

Materials and methods: Data for 10 781 T1DM patients who live in Moscow County is in diabetes mellitus register. During the 2003-2007 period 713 deaths were observed (6,61%). Life duration, life expectancy and causes of death were examined by dividing the cohort into three groups by onset of T1DM. Survival analyses by the Kaplan-Meier method was also used. Statistical analysis was made using standard program.

Results: Mean life duration was 49,61±1,63 yrs (males - 46,497±1,496, females 53,85±1,51) the mean life duration at onset T1DM <10 yrs - 34,99±8,25 yrs, 11-20 yrs - 36,25±1,93 yrs, 21-25 yrs- 44,19±3,97. Life expectancy difference at age 40 between T1DM patients and non-diabetics was greater in women than in men (15,56 and 11,41 yrs). Life-analyses by the Kaplan-Meier method indicated cumulative survival rates of 99,3% at 5 years (2003-2007 yrs). With onset T1DM ≤25 yrs major causes of death were chronic renal failure -30,16%, heart failure- 7,92%, cerebral vascular diseases - 5,42%, acute diabetic complications-2,56 %.

Conclusion: Mean life duration depends on age at onset of T1DM and it is longer if T1DM was diagnosed at age > 25 yrs than at age < 10 yrs. Chronic renal failure is the main cause of death associated with T1DM (30,16%).

No conflict of interest

D-0941

Links between risk factors and adverse pregnancy outcomes among Utah mothers with gestational diabetes

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Aims: The excess risk of gestational diabetes mellitus (GDM) and its related adverse pregnancy outcomes are well known. Key risk factors for GDM include pre-pregnancy weight status, age, parity, and racial/ethnic minority status. This study examines the extent to which each of these four risk factors is associated with an adverse outcome among Utah mothers with GDM.

Methods: Utah birth records (2007) were used to identify the most commonly listed complications of GDM: pregnancy-induced hypertension (PIH), having a C-section delivery, and having a macrosomic infant. Analyses were limited to singleton births to mothers with GDM (N=1,680). Descriptive analyses were

used to examine the prevalence of risk factors among mothers with GDM as well as the relationships between each risk factor and pregnancy outcome. Logistic regression was used to identify the extent to which each of the four risk factors had the greatest effect on increasing the odds for each adverse outcome. Month of entry into prenatal care was controlled.

Results: Nearly one-third (32.7%) of GDM pregnancies ended with a C-section delivery. About nine percent of mothers had PIH and a macrosomic infant (8.9% and 9.4%, respectively). Not unexpectedly, being obese (having a BMI of 30) had the greatest impact on odds for all three adverse outcomes. Most notably, obesity nearly tripled the odds (2.7 times) of having a C-section delivery (p<.001). Obesity doubled (2.2 times) the odds of PIH (p<.01). Obesity increased the odds of having a macrosomic infant by 50% (1.5 times), but the effect was not statistically significant.

Discussion: Pre-pregnancy obesity is a known risk factor for GDM. Among Utah mothers with GDM, obesity prior to pregnancy increased the risk of adverse pregnancy outcomes. These effects were maintained even with other risk factors (age, parity, and minority status) controlled.

C-sections can lead to longer hospital stays for mothers, and increased risk of breathing problems and lower Apgar scores for infants. PIH is a leading cause of fetal complications, and uncontrolled PIH can have potentially fatal effects for mother and infant. More public health efforts to increase women's awareness of the importance of being at a healthy weight prior to becoming pregnant are needed.

No conflict of interest

CLINICAL RESEARCH

Complications - macrovascular 6

D-0942

NT-proBNP versus proteinuria in predicting cardiac events in patients with diabetes mellitus

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Aims: Cardiovascular disease is the main cause of morbidity and mortality in patients with diabetes mellitus. Albuminuria has been so far considered the best independent risk factor for cardiovascular events in patients with diabetes. Recently, special attention has focused on the cardiac hormone B-type natriuretic peptide (BNP). Therefore we aimed to compare the predictive values of N-terminal pro-BNP (NT-proBNP) and proteinuria for short-term cardiac events in diabetic patients.

Methods: In a prospective observational study we recruited 1080 patients with diabetes mellitus. NT-proBNP, renal function and lipid status were measured at baseline. Proteinuria was defined as urinary albumin/creatinine ratio > 30 mg/g. Patients were followed during a mean observation period of 9.6 months, 48 patients reached the defined endpoint (unplanned hospitalization due to a cardiac event).

Results: The mean duration of diabetes was 15 ± 12 years and mean HbA1c was 7.5 ± 3.1%. At baseline, 23.06% of the patients presented proteinuria, and 35.7% had plasma NT-proBNP values above 125 pg/ml. 48 patients reached the defined endpoint. Multiple Cox regression analysis including age, gender, duration of diabetes and HbA1c revealed that NT-proBNP was a better predictor of the defined endpoint than proteinuria (Hazard ratio 1.001; CI 1.001-1.001 p< 0.0001). These results are confirmed by receiver operating characteristics with an AUC of 0.89 (CI 0.747- 0.872 p<0.0001) for NT-proBNP compared with an AUC of 0.674 (CI 0.523-0.75 p<0.0001) for proteinuria.

Conclusion: NT-proBNP seems to be the better predictor of the upcoming short-term cardiac event in patients with diabetes mellitus.

No conflict of interest

D-0943

Serum cystatin C and risk factors for cardiovascular disease in type 2 diabetic patients with metabolic syndrome

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Aims: Cystatin C, a cysteine proteinase inhibitor, is associated with progressively unfavorable lipid and lipoprotein concentrations and with metabolic syndrome (MS), and it can enhance cardiovascular risk prediction in different populations, independently of traditional cardiovascular risk factors, although not all authors agree. This study was carried out to determine the relationship between cystatin C, diabetes, MS components and risk factors for cardiovascular disease, in type 2 diabetic patients with MS.

Methods: To analyze possible links and determinants of cystatin C, simple and multiple regression analyses were performed on metabolic parameters measured in 50 type 2 diabetic patients: waist circumference, HbA1c, HOMA, creatinine, uricemia, uricuria, microalbuminuria and eGFR, triglycerides, HDL cholesterol, LDL cholesterol, oxidized LDL, and small LDL particles. Principal component analysis (PCA) was also used to characterize the overall behaviour and interrelationships among the metabolic parameters.

Results: Cystatin C concentrations of type 2 diabetic patients were significantly higher compared with healthy subjects (1.01±0.23 *vs* 0.73±0.17 mg/L, respectively, p<0.0001). With simple regression analysis, significant correlation was found only between cystatin C *vs* plasma creatinine (r= 0.7148, p<0.0001), eGFR (r=-0.7166, p<0.0001) and uricemia (r=0.3328, p<0.02). Stepwise forward multiple regression analysis, considering cystatin C as dependent variable, showed a significant contribution only from plasma creatinine (coefficient±SE: 0.0055±0.0020, p=0.0059) and eGFR (-0.0077±0.0020, p=0.0012). The correlation coefficient of the model was r=0.7849 (p<0.0001). All the remaining variables, except for uricuria, which gave a coefficient close to being significant (0.0270±0.0150, p=0.08), were not significant contributors to the regression. Considering PCA analysis, it can be argued that cystatin C is strictly positively related to plasma creatinine, confirming what was found with linear regression analysis. Some positive links were found also between cystatin C and waist circumference, as well as triglycerides, HOMA, LDL cholesterol, oxidized LDL and small LDL particles, while a negative link was found between cystatin C and eGFR, uricuria, and HDL cholesterol. No relationship was found with microalbuminuria and HbA1c.

Conclusion: Our study shows that cystatin C concentrations are higher in type 2 diabetic patients with MS and are associated with parameters of renal function, lipid profile and lipoprotein abnormalities. The correlation between cystatin C and other components of MS may suggest a common etiological factor, where cystatin C could have a role as a promising marker of renal function and metabolic syndrome.

No conflict of interest

D-0944

N-terminal pro-brain natriuretic peptide(NTproBNP) as a marker for diabetic complications independent of ischemic heart disease (IHD) or heart failure

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Aims: It is important to establish a biochemical marker that allows early diagnosis of ischemic heart disease (IHD) including silent myocardial ischemia and diabetic cardiomyopathy specific to diabetes. We conducted the present study to assess whether there is a link between NTproBNP and diabetic complications in type 2 diabetes.

Research design and methods: We enrolled 105 subjects (age 64.8±1.0 years, the duration of diabetes 10.8±1.0 years, HbA1c 8.1±0.2% (mean±SE)). NTproBNP was measured by ECLusys pro BNP. Medical records, laboratory and echocardiographic data were collected simultaneously.

Results: NTproBNP levels were 242.4±37.3 (mean±SE, 5.6 to 2234.0) pg/mL. Log-transformed NTproBNP (log (NTproBNP)) was positively correlated

with age, serum creatinine, left atrial diameter (p<0.0001), and left ventricular diastolic diameter (LVDd) (p=0.01), left ventricular systolic diameter (LVDs) (p=0.03) and left ventricular mass (LVmass) (p=0.0006). Log(NTproBNP) was negatively correlated with eGFR (modified MDRD) (p<0.0001). Log(NTproBNP) was significantly elevated in the subgroup with IHD (41 cases) (p<0.0001) and it tended to increase with the additional comorbidity of macroangiopathy. After adjustment for eGFR, age and HbA1c, log (NTproBNP) remained an independent indicator of prior IHD (p<0.05). When subgroups without overt heart failure (defined as LVEF>40%;89 cases) or without history of IHD were analyzed, similar results were obtained.

Conclusion: Our data suggest that NTproBNP may reflect left ventricular function in diabetes independent of prior heart disease, NTproBNP might therefore serve as a marker for incipient cardiac complications such as SMI or diabetic cardiomyopathy and there is a possibility that NTproBNP may reflect non-cardiac complications irrespective of the history of IHD or heart failure.

No conflict of interest

D-0945

Adiponectin multimers and ADIPOQ variants in relation to coronary artery disease in Caribbean type 2 diabetic subjects of South Indian and African descents

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Adiponectin (Ad) is a protein secreted by adipose tissue. Decreased plasma levels of adiponectin have been associated with obesity-related disorders including type 2 diabetes (T2D) and arteriosclerosis. The adiponectin-encoding gene, *ADIPOQ*, is localized on chromosome 3q27 within the region which was identified as susceptibility locus for T2D and metabolic syndrome. Ethnic differences in these associations have been suggested.

Aims: The aims of the study were to determine the frequency of adiponectin multimers and of four variants of *ADIPOQ* and to quantify their associations with prevalent coronary artery disease (CAD) in Carbbean subjects of African and South Indian descent (Afro-Caribbeans (AC) and Indians).

Methods: In a cross sectional study conducted in the French West Indies University, we studied 274 T2D volunteers from the hospital departments of Endocrinology and Cardiology. Coronary artery disease was defined on the basis of a history of angina pectoris, acute myocardial infarction, coronary bypass surgery or coronary angioplasty. Circulating total and multimer adiponectin, High molecular weight (HMW), middle molecular weight (MMW) and low molecular weight (LMW) were assayed by ELISA kit. Genomic DNA was extracted and four single nucleotide polymorphisms (SNPs) of Ad gene were genotyped: +45TG, +276GT, -11391AG and rs182052. ANCOVA, Pearson correlation tests, logistic regression were used.

Results: Among the 274 T2D subjects, 104 had prevalent CAD (among whom 75 myocardial infarctions). Indian subjects had significantly lower body mass index and HDL-C levels and significantly higher waist to hip ratio and triglycerides levels compared to ACs. Total Ad levels were significantly lower in those with CAD than in the others (6.7 *v* 8.6, *P=0.03*). Ethnic differences in total Ad, adiponectin multimers and HMW/total Ad ratio were noted. Among the 4 SNPs studied in the adiponectin gene, we found associations with prevalent CAD only for the SNP +45TG. The frequency of carriers of the minor allele 45G (GG/TG) was significantly higher in subjects with CAD (22% *v* 11%, *P=0.01)* than in those without CAD, with differences in ethnic groups. After adjustment for ethnic groups and other covariates, the adjusted OR of CAD was 3.3 (1.2 - 8.8), *P=0.04)* for carrying the 45G minor allele.

Conclusion: In addition to anthropometric parameters and lipid differences between subjects of South Indian and African descents, adiponectin levels and 45 TG SNP could contribute to the difference in cardiovascular risk between these ethnic groups.

No conflict of interest

D-0946

Associations of aminotransferase activities with cardio-metabolic risk factors - implications for clinical practice

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Increasing prevalence of obesity has made non-alcoholic fatty liver disease (NAFLD) a major health problem that is found in association with increased cardio-metabolic risk. Aminotransferase (aspartate aminotransferase (AST), alanine aminotransferase (ALT)) concentrations have been shown to be associated with indices of obesity and may reflect NAFLD. This study explores the associations of ALT and AST with indices of obesity, adipokines, insulin resistance and components of the metabolic syndrome in an alcohol free normoglycemic population with negative medication history and hepatitis screen. Anthropometric measurements and fasting adiponectin, leptin, leptin receptor, insulin, glucose, high-sensitivity C-reactive protein (hs-CRP) and lipid profile were measured in 429 (155M, 274F) subjects. Univariate regression and multivariate logistic regression analyses were used to relate the aminotransferases with indices of obesity, adipokines as well as with the degree of adiposity (BMI≤25, 25.1 - 29.9 or ≥30), insulin resistance (homeostasis model assessment (HOMA-IR ≤2 or >2)) and the number of the criteria of the metabolic syndrome (MS) (International Diabetes Federation (IDF) criteria). 89 (21%) of subjects were classified as MS positive. All the study subjects had normal ALT and AST but gender dimorphism was noted with males having higher mean ALT (27.7 IU/L) and AST (23.5 IU/L) than females (17.4 and 20.0 IU/L respectively). ALT and AST showed stepwise increase with increasing categories of obesity, insulin resistance and the number of criteria of the metabolic syndrome. ALT showed significant correlations with age (r = 0.13), indices of obesity (r = 0.32 for BMI; r= 0.36 for waist circumference), beta cell function (%B) (r= 0.14) insulin (r= 0.18), HOMA-IR (r= 0.27), triglycerides (r= 0.24), hs-CRP (r= 0.25) and inverse correlations with adiponectin (r= -0.29), insulin sensitivity (%S) (r= -0.27) and HDL-cholesterol (r= -0.25). AST showed similar correlations. Adiponectin, HOMA-IR, %B and %S retained their significance after partial correlation analysis correcting for indices of obesity. In logistic regression models adjusting for age and sex, subjects in the 4th quartiles of ALT (odds ratio (OR) 3.8 (95% CI 1.3–10.9) and AST (OR 2.5 (95% CI 1.1–5.7) had significant risk of MS compared with those in the 1st quartile. We conclude that aminotransferases are significantly associated with cardiometabolic risk factors and should be included in routine laboratory risk assessment. As concern is growing about NAFLD, not only because it is a common liver disorder, but also because it is one of the leading causes of chronic liver disease, laboratories may need to lower the upper normal reference limits to facilitate earlier detection of obesity-associated increases in aminostransferases.

Conflict of interest:
Other substantive relationships: Grant providers: Kuwait Foundation for the Advancement of Science (KFAS) Project No. 2004-1302-03

D-0947

The expression of CD16 or toll-like receptor (TLR) 4 on peripheral CD14+ monocytes in subjects with various stages of glucose tolerance or in patients with coronary artery disease

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Monocytes are involved in the pathogenesis of inflammatory disease. The CD14+16+ or Toll-like receptor (TLR) 4+ monocytes may play a significant role in the pathogenesis of insulin resistance or atherosclerosis. We investigated the relationship between the expression of CD16 or TLR4 on peripheral CD14+ monocytes and the disease severity in subjects with different stages of glucose metabolism or in patients with coronary artery disease (CAD). We studied 40 male subjects with various stages of glucose tolerance [10 subjects with normal glucose tolerance (NGT), 10 with impaired glucose tolerance (IGT), and 20 with type 2 diabetes (DM)], and 35 male patients with CAD. The expression of CD16 and TLR4 on peripheral monocytes was measured using flow cytometry. In 40 subjects with various stages of glucose tolerance, the number of CD16+ monocytes was significantly higher in subjects with DM than in those with NGT (32.2% vs. 4.6%, P<0.01). The number of TLR4+ monocytes was significantly higher in subjects with metabolic syndrome than in those without

metabolic syndrome (4.9% vs. 1.9%, P=0.0016). In 35 patients with CAD, the number of CD16+ monocytes correlated positively with waist circumference, hemoglobin A1c, and triglyceride. The number of CD16+ monocytes was significantly higher in CAD patients with than without metabolic syndrome (23.6% vs. 7.9%, P=0.0093). The number of CD16+ monocytes was higher in CAD patients with 3-vessel disease than in those with 1- or 2-vessel disease. In conclusion, both CD16+ and TLR4+ monocytes are associated with the components of metabolic syndrome, irrespective of the presence or absence of CAD. Furthermore, the number of CD16+ monocytes may reflect the disease severity in patients with CAD.

No conflict of interest

D-0948

Promoter polymorphism of the matrix metalloproteinase 3 gene in diabetes mellitus patients and risk of coronary artery disease in an Iranian subjects

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Aims: Matrix metalloproteinase-3 (MMP3) -1612 5A/6A gene polymorphism has an effect on MMP3 expression which leads to low promoter activity 6A6A, intermediate promoter activity 5A6A and high promoter activity 5A5A genotypes, have been shown to be associated with coronary artery diseases (CAD) (e.g., coronary stenosis, myocardial infarction, coronary artery calcification, etc.). The aim of our study was to estimate the functional polymorphism in MMP3 gene in diabetes mellitus patients and test the hypothesis that this polymorphism in diabetes mellitus patients might be predictor of susceptibility to coronary artery disease.
Methods: Ninety-five CAD patients and one hundred three healthy control subjects were included in this study. MMP3 genotypes were determined by polymerase chain reaction and restriction fragment length polymorphism.
Results: Significant differences between cases and controls were observed for MMP3 genotype frequencies (X^2=14.606, p = 0.001). The 6A allele was less frequently seen in the control group, compared to the disease group (80.79 vs. 71%, 6A/6A+5A/6A vs. 5A/5A, *P*=0.001).
Conclusion: We for first time indicated that MMP3 -1612 5A/6A polymorphism is involved in diabetes mellitus and is a genetic susceptibility factor for CAD in diabetes mellitus.

No conflict of interest

D-0949

Promoter polymorphism of the matrix metalloproteinase 3 gene in diabetes mellitus patients and risk of coronary artery disease in Iranian subjects

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Conclusions: We for first time indicated that MMP3 -1612 5A/6A polymorphism is involved in diabetes mellitus and is a genetic susceptibility factor for CAD in diabetes mellitus.

No conflict of interest

Complications - neuropathy 2

D-0950

An attenuated parasympathetic nerve activity is related to insulin resistance in healthy subjects with or without a family history of diabetes.

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Background and aims: Insulin resistance occurs early in the development of type 2 diabetes. An altered balance in the autonomic nervous system may contribute. The aim of this study was to evaluate the autonomic nervous system in healthy first-degree relatives of type 2 diabetes patients and healthy controls and assess the relationship to insulin resistance.
Subjects and methods: 23 healthy individuals with first-degree relatives with type 2 diabetes (R) were compared with 24 control subjects without a family history of diabetes (C). The groups were matched for age, BMI and sex. A hyperinsulinemic, euglycaemic clamp (56 mU/min/m^2) and an oral glucose tolerance test (75 g glucose) were performed. Analysis of heart rate variability (HRV) during rest, controlled breathing, an orthostatic manoeuvre and a standardised physical stress (cold pressor test, CPT), was used to assess the activity of the autonomic nervous system.
Results: Insulin sensitivity, reflected by the M-value, was similar in the two groups. HbA1c, fasting blood glucose and serum insulin did not differ significantly between the groups. HRV did not differ significantly between the R and C groups. There were significant negative associations between insulin sensitivity and low-frequency (LF) spectral power as well as low frequency/high frequency (LF/HF) spectral power ratio in the basal state (r= -0.34, p=0.028 and r= -0.34, p=0.026, respectively), during controlled breathing
(r= -0.44, p=0.003 and r= -0.45, p=0.002), during CPT (r= -0.35, p=0.026 and r= -0.37, p=0.019) and during and after tilt (r= -0.37, p=0.016 and r= -0.40, p=0.008, r= - 0.31, p=0.036 and r= -0.33, p=0.031). Furthermore, insulin sensitivity was significantly and positively associated with high-frequency (HF) power during CPT r=0.33, p=0.036). When all subjects were divided into two groups by insulin sensitivity (mean M-value), LF power and LF/HF ratio was significantly higher in the low M-value group during controlled breathing (p=0.004 and 0.003, respectively) and tilt (p=0.012 and 0.012, respectively).
Conclusion: An altered balance of the parasympathetic and sympathetic nervous activity, mainly explained by attenuated parasympathetic activity, was related to insulin resistance, but no difference was found between subjects with first-degree relatives with type 2 diabetes and control subjects without a family history of diabetes.

No conflict of interest

D-0951

Gastric emptying measured by C13-CO2-octanoate breath-test: Lessons from clinical use in 259 patients with type 1 diabetes mellitus and 52 patients with type 2 diabetes mellitus.

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Aims: Retardation of gastric emptying up to complete gastroparesis is known as one of the most challenging complications of diabetes mellitus. Since 2001 the method of measuring gastric emptying by means of the C^{13}-CO_2-octanoate breath test is established at the center for treatment of diabetes in Bad Lauterberg, Germany. In the latter we try to evaluate the diagnostic value and the indications for this type of diagnostic procedure.
Methods: From 2005 until 2007 all patients (n=354) who had a measurement of gastric emptying were identified and analysed. In case of repeated measurements the latest test was chosen. 259 patients with T1DM and 52

patients with T2DM were included and the results of C^{13}-CO_2-octanoate breath tests were compared with the results of 25 healthy subjects. 25 tests performed in patients with diabetes other than T1DM or T2DM or patients with operatively changed anatomy of upper gastrointestinal tract were excluded. A delayed gastric emptying was diagnosed when the one-sided upper 90 % confidence interval (mean + 1.605 SD) of gastric half emptying time of the healthy control group was exceeded. Clinical characteristics of patients with delay of gastric emptying and unaffected individuals were compared (ANOVA). Indications for testing gastric emptying time were analysed by chi-square-test.

Results: C^{13}-CO_2-octanoate breath test was performed much oftener in patients with T1DM than in subjects with T2DM (reference: all treated patients; 259/2339 vs. 52/4672, $p < 0.0001$). The probability of delayed gastric emptying was 17/259 in T1DM (6.6%) and 5/52 in T2DM (9,6%). Main indications for testing were postprandial hypoglycaemia (n=44) and unexplained excursions of blood glucose (n=146) in T1DM and gastrointestinal discomfort (n=19) in T2DM. Patients with delayed gastric emptying and T1DM had more elevated $A1_c$ levels (8.65 vs. 7.78), a faster resting heart rate (82.9 vs. 74.4 min^{-1}; p=0.009) and a lower systolic blood pressure (120.2 vs. 135.4 mmHg; p=0.004).

Patients with T2DM and delayed gastric emptying had more episodes of self reported hypoglycaemia per week (4.5 vs. 0.85; p=0.007).

Dicussion: Delay of gastric emptying is extremely rare even in a collection of highly pre-selected patients with diabetes (approximately twice the expectation). The diagnostic procedure is mostly performed due to unsatisfying stability of blood glucose levels in subjects with type 1 diabetes mellitus, in type 2 diabetes mellitus mostly because of abdominal discomfort. Patients with delayed gastric emptying and type 1 diabetes mellitus show poorer control of $A1_c$ and a higher resting heart rate as a hint for cardiac autonomic neuropathy. The rate of hypoglycaemia increases in patients with delayed gastric emptying and type 2 diabetes mellitus.

No conflict of interest

D-0952

Short-term spectral analysis of heart rate variability could predict subclinical cardiovascular disease in type 2 diabetes mellitus

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Aim: Cardiac autonomic neuropathy (CAN) in diabetes is associated with increased mortality. We investigated correlations of CAN with subclinical atherosclerosis and myocardial perfusion in Type 2 diabetes.

Methods: Two hundred patients (aged 60 ± 11 years, 67 males and 133 females) with type 2 DM were enrolled in this cross sectional study. We assessed total CAN scores from 5 tests (heart rate response to Valsalva maneuver, deep breathing, and standing: blood pressure response to standing, and sustained handgrip). We also determined powers in total- (TP), low- (LF), and high-frequency (HF) bands and standard deviations of all N-N intervals (SDNN), which are derived from all intervals between adjacent QRS complexes, from short-term (5 minutes) spectral analysis of heart rate variability (HRV). The augmentation index (AI), subendocardial viability ratio (SEVR), brachial artery pulse wave velocity (PWV), and ankle-brachial index (ABI) were evaluated from central and peripheral pulse waveform, and carotid intima media thickness (IMT) from carotid sonography. Definite to severe CAN was defined as individuals with CAN score of 2 or more by Ewing's classification.

Results: Mean HbA1c was 8.3 ± 1.8 % and mean duration of diabetes was 12.3 ± 7.8 years. 17.2 % of the participants had definite to severe CAN. The AI, SEVR, PWV, ABI and IMT were not different between individuals with and without CAN. Total CAN scores were significantly correlated with SDNN and TP from spectral analysis of HRV ($g = -0.261$, $P < 0.002$ and $g = -0.275$, $P = 0.001$, respectively). Total CAN scores did not show any associations with these CVD parameters. On the other hand, the SDNN ($g = 0.278$, $P < 0.001$), LF ($g = 0.230$, $P < 0.001$), and TP ($g = 0.308$, $P < 0.001$) were associated with subendocardial viability ratio (SEVR), which remained still significant after adjustment for other CVD risk factors such as age, blood pressure, and LDL-cholesterol.

Conclusion: The indices of HRV from spectral analysis were associated with the SEVR, an estimate of myocardial perfusion relative to cardiac workload, but not with reactivity and thickness in the macrovasculature, expressed as AI, PWV, ABI and IMT.

No conflict of interest

D-0953

Comparison of somatic tests - modified Neuropathy Disability Score, and a new simple instrument for autonomic dysfunction - Neuropad® for early diagnosis of diabetic neuropathy

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Diabetic neuropathy (DN) is the most common late diabetic complication. Somatic and autonomic DN usually develop simultaneously, but autonomic DN is rarely diagnosed in the everyday clinical practice because the tests are time-consuming and there are no simple devices and score systems like in the case of somatic DN. The aim of this study was to compare a new simple test for sudomotor dysfunction – Neuropad – to the somatic diagnostic complex of modified Neuropathy Disability Score (NDS), shown to be predictive for diabetic foot at risk for developing diabetic ulcers.

Patients and methods: In this cross-sectional study participated 264 consecutive (M/F = 126/138) people with DM type 1/2 (61/203), mean age of 55.4 ± 12.0 years and duration of DM of 9.3 ± 7.1 years, excluding other reasons for neuropathy and interfering drugs. The patients underwent testing with modified NDS and the new instrument. Neuropad was stacked on both soles 1-2 cm distally of the point between metatarsal heads I-II. After 10 minutes, the color change of the indicator was read and the patients were divided in 3 groups: normal (complete change from blue to pink = 0 points), borderline (mottled blue/pink color = 1point), abnormal (no color change – the test remain blue = 2 points).

Results: Both, Neuropad and NDS differentiated and stratified people and feet at risk. The groups selected by Neuropad differed significantly in their results for the four tests of NDS separately and in aggregate. Most important determinants for pathological NDS and Neuropad responses were age, diabetes duration and presence of microvascular complications. Most sensitive for detecting DN were the aggregate NDS = 1, followed by Achilles reflexes, vibration perception (128 Hz Rydel-Seiffer tuning fork) and Neuropad. Compared to the markers for presence of somatic DN (NDS = 1) and for foot at risk (NDS = 6) Neuropad showed sensitivity = 77.5 and 84.8%, specificity = 58.3 and 38.7%, positive = 94.9 and 62.8% and negative = 20.6 and 67.6% predictive value respectively.

Conclusions: Early screening for diabetic neuropathy must cover somatic and autonomic disturbances. Neuropad is a new test, sensitive and appropriate for everyday clinical use for detecting DN and identification of diabetic foot at risk.

No conflict of interest

D-0954

Psychological process and psychometric study of diabetic and non-diabetic men undergoing penile prosthesis surgery for erectile dysfunction

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This study comprises the results of 100 diabetic and non diabetic men studied during the period 2006- 2008, who had penile surgery for erectile dysfunction, as a part of the National Project in Havana, Cuba.

The main obejctive of the national project was to find out the efficacy, safety and satisfaction among men with penile prosthesis and their partners. This National Study afforded our group a different approach to the same patients from the point of view of psychology and psychometrics.

Aims: To know body representations, anxiety, depression and characteristics of the psychological processes, particularly in reference to the satisfaction with the surgical therapy, and to study the effects of these psychological processes on the bodies of patients and their partners.

Methods: In depth interviews with patients and their partners were conducted and multiple psychological tests were administered, among them: Anxiety test of Catell; MMPI test of Hathaway and MacKinely; Somatic test-Body symbolism of Wilfrd A. Cassell (Cuban Version by C.T. Garcia) and in depth case studies.

Results: 25 % of the men had Diabetes as a Diagnosis. The majority of them had normal results from the Psychometrics tests. Neverthless, 40% of them had psychological conflicts with body symbolism, particularly with vaginal representation. Some of them showed psychological repression, as an example, in front of the card depicting a vagina, they responded, "this is a butterfly", "it is an insect", "it is a flower","this is a dark and dangerous place". In addition a subgroup of the partners, demonstrated conflicts with their partners after the penile surgery and their dissatisfaction with the surgery.

Conclusions: Studies of psychological aspects and the partner relationships as well as psychological counselling were very helpful to improve the satisfaction of patients with diabetes who underwent penile prosthesis surgery for erectile dysfunction. The psychological counselling contributed a great deal to the well being of the patients with diabetes and their partners.

No conflict of interest

D-0955

Prevalence of impotence among men with diabetes mellitus in Jos, North-central Nigeria

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Background: Impotence is a common problem in diabetes. It has been reported that about 50% of men with diabetes eventually become impotent. Impotence in diabetes is particularly distressing as it is usually irreversible but libido is commonly preserved. However, in our experience few men attending the diabetes clinic ask for help for impotence and even fewer are being treated.
Objective: To determine the prevalence of impotence in a male diabetic population and to examine how many had asked for help for their problem.
Methods: Four hundred and fifty six consecutive male patients aged 20-70 years attending the Diabetes clinic of the Diabetes Screening and Care center, Jos, North-central Nigeria were administered a questionnaire. This addressed issues such as whether or not they had erectile dysfunction, whether they would like treatment and whether or not they had ever asked for medical help in the past. Their glycaemic status, presence of proteinuria (including microalbuminuria) and of retinopathy (background or advanced) and hypertension were recorded from the patients' case notes.
Results: The prevalence of impotence was 49.3%, and it increased with age. The prevalence of proteinuria was 11.4% and retinopathy was 24.6%. One hundred and forty(62.2%) had concomitant hypertension and were on treatment. Of the 225 patients with impotence, 34(15%) had DM duration < 1year, majority (47.4%) had duration of DM between 5 and 15 years and 23.4% had duration > 15years. Over 80% were treated for DM with Oral antidiabetic agents only, while less than 20% were insulin treated. The mean HbA1c of the entire population was 8.7±2.6%, while that of patients with impotence was 9.2 ± 3.5%. All the patients with proteinuria and 72% of those with advanced retinopathy had Impotence. Two hundred and seven (92%) of patients with impotence wanted treatment; 128 had never asked for treatment (56% for embarrassment, 30% for ignorance of availability, 9% had no reason); 126 had consulted different Doctors for treatment; 72 (32%) knew impotence was a complication of Diabetes; 81(36%) had sought traditional (native) treatment.
Conclusion: The prevalence of impotence in this population of Diabetics is high and reluctance to report the problem and ignorance about available treatment is common. Available treatment for impotence in Diabetes is not very effective and is too expensive for the Nigerian Diabetic male population. Clearly, extra resources will have to be found if more impotent men are to be treated within the Health Service.

No conflict of interest

D-0956

Stratification of risk factors in diabetic patients by a new test for sudomotor dysfunction - Neuropad

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Diabetic neuropathy (DN) begins insidiously and engages somatic and autonomic nerve functions. The global spread of diabetes (DM) and the importance of early therapeutic intervention determine the need of simple, inexpensive and sensitive methods for diagnosis of diabetic complications in the general practice.
Aim: of this study was to investigate the value of a new instrument – the plaster Neuropad in identification and stratification of diabetic patients at different micro- and macrovascular risk.
Patients and methods: In this cross-sectional study participated 264 consecutive inpatients (M/F=126/138) with DM type 1/2 (61/203), mean age of 55.4±12.0 years and duration of DM of 9.3±7.1 years. According to hospital records personal data file for every patient was created including: anthropometric data; FPG and HbA1c; presence of micro-(retino-, nephro-, neuropathy), and macrovascular (arterial hypertension, coronary-and brain vascular disease (CHD/BVD), dyslipidemia) complications. Neuropad was stacked on both soles 1-2 cm distally of the point between metatarsal heads I-II. After 10 minutes the color change of the indicator was read and the patients were divided in 3 groups: normal (complete change from blue to pink=0 points), borderline (mottled blue/pink color=1), abnormal (no color change – the test remain blue=2). The groups were compared and the adjusted for age and gender Odds ratios were calculated.
Results: are presented on the tables. *-p<0.05; **-p<0.01; ***-p<0.001.

Groups, differentiated by Neuropad						
Group	2	p for 2/1 groups	1	p for 1/0 groups	0	p for 0/2 groups
N	19		164		81	
Age†	64,1±11,5	*	57,7±10,7	***	48,6±12,7	***
CHD/BVD‡	3 (15.8)	*	56 (34.1)	***	8 (9.9)	NS
DM 2‡	14 (73.7)	NS	137 (83.5)	***	52 (64.2)	NS
Duration of DM†	15,2±8,5	**	10,0±7,1	***	6,5±5,9	***
Nephropathy‡	3 (15.8)	NS	15 (9.1)	*	2 (2.5)	*
Retinopathy‡	10 (52.6)	*	47 (28.7)	NS	19 (23.5)	**
Neuropathy‡	11 (57.9)	NS	94 (57.3)	***	28 (34.6)	*
†-years (mean ±SD); ‡-N (% of patients in the same group);						

Importance of different risk factors for having positive results with Neuropad		
Factor	Adjusted OR (CI) for having borderline (1 point)	Adjusted OR (CI) for having abnormal (2 points)
Age (for each year more)	1.04*** (1.02-1.06)	1.08*** (1.04-1.13)
Diabetes duration (for each year more)	1.06** (1.02-1.10)	1.11*** (1.05-1.12)
Insulin treatment	1.47 (0.79-2.72)	16.08** (3.25-79.49)
CHD/BVD	3.58** (1.57-8.12)	1.04 (0.24-4.52)
Nephropathy	4.93* (1.03-23.69)	3.01 (0.23-39.13)
Retinopathy	1.36 (0.72-2.60)	4.10* (1.38-12.22)
Neuropathy	2.49** (1.40-4.43)	2.80 (0.97-8.13)

Conclusion: The test Neuropad is effective in stratifying patients at different risk for diabetes complications.

No conflict of interest

D-0957

Cardiac autonomic neuropathy in type 2 diabetes patient with microalbuminuria

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Background and aims: Prevalence of microalbuminuria (MA) and cardiac autonomic neuropathy (CAN) increases together with the increase in diabetes duration (DD); they are considered to be significant risk factors for cardiovascular events in type 2 diabetic (T2DM) patients (pts). Our aim was to assess CAN, heart rate variability (HRV), QTc interval dispersion (QTcd), silent myocardial ischemia (SMI), non-dipper phenomenon in T2DM with microalbuminuria.
Materials and methods: We supervised 2 groups (Gr): Gr.1-without (n=52, 23m/29f, mean age 52.6±13.1 yrs) and Gr.2 with MA (albumin excretion rate 30-300 mg/l, n=50, 26m/24f, mean age 54.3±9.7 yrs). In all pts 24-h ambulatory ECG and BP monitoring were performed. Time domain HVR parameters and SMI episodes were assessed on Holter ECG. QTcd was measured on surface ECG. CAN severity was evaluated using Evings 5 - standard tests (severe CAN-scores 7-10, moderate- 4-6, mild- 2-3, no CAN - 0-1). Mean 24-h BP was measured on ABPM. DD, HbA1c, plasma lipids were also assessed.
Results: Pts with MA (mg/l) have significantly higher 24-h BP, than those without MA (139.5±19.3 vs 131.1±16.2, p=0.018). There were more non-dippers in Gr.2, than in Gr.1 (24% vs, 13.4%). HRV parameters: SDNN (0.096±0.037 vs 0.127±0.032 msec, p= 0.000) and Triangular index (26.5±6.3 vs 34.8±8.1 p=0.000) were significant by lower; QTcd was longer (48.7±9.7 vs 38.5±11.7 msec, p=0.000), and SMI episodes were more frequent in Gr.2, than in Gr.1 (32% vs 21.1%). CAN prevalence was: severe-9.1% (Gr.1), 16 % (Gr.2); moderate - 25% (Gr.1), 42% (Gr.2); mild - 36.5% (Gr.1), 36% Gr.2; no CAN-28.8% (Gr.1), 6% (Gr.2). Severe and moderate CAN were more frequent in MA pts. DD was

significantly longer in Gr.2 (11.3±3.6 vs 6.7±2.9yrs, p=0.000). HbA1c values did not differ between the groups (7.9±0.13 vs 7.3±0.12% p=0.181).
Conclusion: Pts with MA showed association between DD, BP and CAN parameters. CAN plays important role in hypertension and non-dipper phenomenon development, and HRV decrease in diabetes. Pts with MA need more detailed investigation to reveal cardiovascular risk and timely initiate preventive measures.

No conflict of interest

Insulin therapy

D-0958

Why to establish a pump registry in Germany? A comparision of MIT and CSII in 11 872 adult type 1 diabetics, based on a multicenter database

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Background and aims: Intensified insulin therapy (MIT) and insulin pump therapy (CSII) are well established options for insulin substitution in type 1 diabetics. The estimated number of insulin pump users in Germany is about 44 000, but less is known about their social and clinical data. Most of them are treated by physicians who have only few patients on CSII. So data on pump therapy under real-life-conditions in large multicenter databases are rare (DPV-Science Initiative).
Results: By March 2009, data on 11 872 adult subjects with type 1 diabetes were available for analysis: mean age 36,8±0,2 years, range 18-89 years, gender ratio 51% males and 49% females, mean age at onset of diabetes 20.6±0,1 years, mean diabetes duration 16,2±0,1 years.
8746 patients (73,7%) used multiple daily injections, while 3126 (26,3%) used CSII. Diabetes duration was longer in pump patients (20,3 vs14,7 years, p<0.0001), and more women opted for CSII (57 vs 46%, p<0,0001). Daily insulin requirement was lower in CSII (45,2±0,4 Units compared to 53,6±0,3 Units, p<0,0001). 54 % of subjects on MIT used insulin analogs, compared to 74 % of CSII patients (p<0,0001). Mean HbA1c was 7,8 % in CSII patients and 8,0 % in MIT (p<0,05), this difference was still present after adjustment for age, duration of diabetes, gender, insulin dose, insulin preparation, degree of overweight and center heterogeneity. In addition, the rate of severe hypoglycaemic episodes was slightly lower in CSII (29,6 vs 36,6 events per 100 patients-years, p=0,06) compared to MIT patients. However CSII patients were slightly more overweight with a BMI of 25.9 kg/m^2 compared to 24.9 kg/m^2 in MIT patients (p<0,0001).
Conclusion: Updated results (March 2009, DPV) are: In CSII patients, insulin requirement is significantly lower, metabolic control (HbA1c) is significantly better and BMI is slightly higher compared to MIT. In Germany medical insurance companies usually reimburse insulin pump therapy on the basis of improvement of HbA1c-levels. Therefore the German Diabetes Technology Group (AGDT, subgroup of the German Diabetes Society) starts a nationwide insulin pump registry (epidemiological data and 91 questions about diabetes progress and therapy) to document the global and individual benefit of CSII. Also a certification for insulin pump centers will improve quality in education and treatment of patients using CSII therapy and may facilitate reimbursement by health insurance.

No conflict of interest

D-0959

Hypoglycaemia in type 1 diabetic patients treated with CSII during driving - results of continuous glucose monitoring

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Aims: Hypoglycaemic episode during driving could cause a fatal accident. Using continuos glucose monitoring in type 1 diabetic patients, we wanted to determine the glycaemic excursions during periods of driving.
Methods: We monitored 21 patients with type 1 diabetes mellitus treated with CSII (6 female, 15 men), duration of disease 11,2 ± 5,4 year, duration of treatment 4,2± 1,87 year. Each patient wore CGMS for 3-5 working days during his normal activity and was not alowed to see actual glycaemic values. Patients were asked to record all important events (such as insulin injection, exercise, meals, working periods) including periods of a car driving. After CMGS use, continuous glucose profiles were reviewed to identify glycaemic excursion during periods of car driving, with a special interest in hypoglycaemic episodes (values under 3,5 mmol/l) and periods of glycaemia under 4,5 mmol/l with considerable risk of hypoglycaemia.
Results: We evaluated 4761 min (79 hours 21 min) of driving, an average 79,2 ± 37,8 per day and patient. Patients recorded 4 symptomatic episodes while driving. We found 11 episodes of asymptomatic hypoglycaemia, all in 4 patients. Total time of driving with glycaemia under 3,5 was 52 min (1,1 %), with glycaemia under 4,5 mmol/l it was 256 min (5,4 % of total driving time).
Conclusion: Risk of hypoglycaemia even in well experienced patients with type 1 diabetes mellitus treated with CSII during driving is considerable and should be regularly adressed in education.

No conflict of interest

D-0960

Differences in long-term metabolic control and BMI in children with type 1 diabetes on insulin pumps stratified by age and sex

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Aim: There is conflicting evidence of long-term sustained improvement in A1C among children with type 1 diabetes (T1D) using insulin pumps, and whether outcomes differ with gender, age and prior metabolic control. This practice audit follows a previous evaluation of annual change in A1C and BMI z-score from baseline among patients at our centre, and attempts to assess for differing outcomes based on age, sex and prepump A1C.
Methods: Practice audit of patients whose pumps were initiated from 2000-2008 at our centre. Inclusion: pump initiation > 18 months post T1D diagnosis; > 1 yr follow-up; > 2 A1C tests in the 6-12 months pre-pump at our centre. Of 122 pump patients, 40 (60% males) were eligible for analysis. Mean age and diabetes duration at pump start were 10.8 yrs and 4.8 yrs respectively; mean follow-up was 4.2 years. Data was stratified by sex, prepump A1C and BMI z-score. Intention-to-treat analysis was performed using a paired T-test and to compute 95% confidence intervals (95CI).
Results: A1C showed a statistically and clinically significant sustained improvement across all years of a 7-year follow-up for the cohort, with a mean change of -1.0 (95CI: -1.3, -0.7). Children with a prepump A1C >8.7% significantly decreased their mean A1C by -1.1 (95CI: -1.4, -0.8), while there was no significant change for those with a pre-pump A1C <8.7%. Mean A1C decreased -1.1% (95CI: -1.5, -0.7) in children <11 yr irrespective of gender. Older children (>11 yr) decreased A1C by -0.7 (95CI: -0.2,-1.1). In older males (>11 yr) mean A1C decreased by -1.0 (95CI: -1.5, -0.5). Older girls (the smallest sub-group), showed a trend towards a first-year decrease in A1C that did not reach statistical significance, and which was not sustained. There was no significant change in BMI z-score except in older boys whose BMI z-score increased +0.37 (+0.18, +0.55). Five children (12.5%) discontinued pump use for the following reasons: allergy to catheter dressing (1); poor adherence / frequent ketosis (2); defective device not replaced (1); lost device (1).
Discussion/conclusion: In general, insulin pump users at our centre showed a clinically and statistically significant improvement in metabolic control which was sustained over 7 years of pump use without a significant change in BMI z-score. However, these improvements were not sustained across all ages and genders. Greater improvements were associated with higher A1C and younger age (<11 yr) pre-pump, irrespective of gender. In younger children, pump

use was associated with a clinically and statistically significantly, sustained improvement in A1C that was "weight neutral." Improved metabolic control in older males was associated with a statistically significant increase in BMI z-score. Older females showed no significant change in either A1C or BMI z-score. Future research will compare these outcomes to patients not started on pumps, matched for age, sex and diabetes duration

Conflict of interest:
Paid lecturing: E. Pytka: Animas Corporation
Advisory board: N. Dumouchel: Abbott advisory board (recipient of honorarium)
Other substantive relationships: A. Bossy: Certified Insulin Pump Trainer: Animas Pump (Johnson & Johnson), Medtronic Pump (Medtronic of Canada Ltd), Cozmo Pump (Smith's Medical Inc.)E.Pytka: Certified Insulin Pump Trainer: Animas Pump (Johnson & Johnson), Spirit Insulin Pump (Disetronic Medical Systems / Roche Diagnostics of Canada Ltd), Cozmo Pump (Smith's Medical Inc.)

D-0961

DM2 patients on insulin therapy can achieve the same weight loss as patients not on insulin while simultaneously improving diabetes control

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Introduction: It is generally accepted that DM2 patients on insulin therapy gain weight and, although tighter glucose control improves A1c, it usually leads to concurrent increase in weight. We conducted a retrospective 18 month study of DM2 patients referred for DM education, comparing the diabetes control (A1c) and weight change of patients on insulin with patients not on insulin. We postulated that if diabetic patients receive effective education through Medical Nutrition Therapy (MNT) and diabetes self management skills, diabetes control can be achieved by patients on insulin, without the undesirable weight gain.
Materials: A total of 1,141 adult patients with DM2 were studied, 23% on insulin and 77% not on insulin. Half of the patients not on insulin didn't take any hypoglycemic medication. The mean initial A1c was 8.9% and 7.5% for the group on and not on insulin, respectively. 56% were female, 44% male; 78% Caucasian, 15% African American, 6% Hispanic. Only 20% of the patients had previous DM education, mean age was 61 and 86% were overweight.
Methods: Patients received individual education by a clinical dietician/ diabetes educator, including carbohydrate counting using the exchange system, with insulin to carbohydrate ratio for patients on rapid acting insulin. A carbohydrate distribution of 45-60 grams per meals and 15-30 grams per snacks was suggested, and a 500 kcal deficit was applied to the meal plans of overweight patients. Insulin was adjusted as needed. Patients were to record FBS and 2 hours pp glucose, increase physical activity, and keep follow-up every 3 months. A repeated measures statistical analysis was performed considering the variables A1c and weight over 18 months, while controlling for dropout rate.
Results: A statistically significant and consistent decrease in A1c was observed over the 18 months for both groups studied ($p < 0.001$). The average A1c compared to initial was 7.4, 7.0, 7.1, 6.9 and 6.7 mg/dl for the insulin group and 6.5, 6.4, 6.3, 6.3, and 6.2mg/dl for the non insulin group, at 3, 6, 9, 12 and 18 months, respectively. The statistical analysis for weight also showed a significant and consistent decrease for both groups over time (p-value < 0.001), indicating that there was no difference in the average weight loss, nor in the pattern of loss, for either group of patients. The average drop in weight was 2.3, 3.6, 4.4, 4.9 and 6.6 kg for the patients on insulin and 4.5 5.6, 6.1, 6.4 and 6.4 kg for the patients not on insulin, at 3, 6, 9, 12 and 18 months, respectively. The dropout rate was similar for both groups.
Conclusion: This study demonstrates that a significant reduction in A1c can be achieved in DM2 patients on insulin therapy, without undesirable weight gain. Individual MNT is as effective in promoting good diabetes control and weight loss in DM2 patients on insulin, as it is in patients not on insulin therapy.

No conflict of interest

D-0962

Treatment experience and satisfaction of type 2 diabetic patients treated with a basal-bolus regimen using insulins glargine or detemir as basal insulin: results from the LIVE-COM study

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Objectives: Patient-reported outcome (PRO) measures can be used to examine whether drug differences other than clinical aspects have an impact on outcomes that may be important to patients. Although basal insulins glargine (GLA) or detemir (DET) appear to have similar clinical efficacy for treatment of type 2 diabetes (T2D), there are several differences between these two regimens that could affect outcomes from a patient's perspective. The purpose of this study was to compare treatment experiences (TE) and treatment satisfaction (TS) associated with insulin administration in T2D patients treated with either GLA or DET in a basal-bolus regimen for at least 6 months.
Methods: The study "Long Acting Insulin Glargine versus Insulin Detemir Cost Comparison in Germany" (LIVE-COM) was a non-interventional, cross-sectional, retrospective study performed between April and September 2008 in 138 randomly selected centers of primary care physicians in Germany. The study enrolled 1731 T2D patients with statutory health insurance status who were eligible for documentation when either treated with GLA (n=1150) or DET (n=581) as part of a basal-bolus regimen for at least 6 months prior to documentation. Patients completed the Insulin Treatment Experience Questionnaire (ITEQ), a new condition-specific instrument assessing TE and TS, and the Diabetes Treatment Satisfaction Questionnaire (DTSQs). To examine differences between the two treatment groups, independent *t*-test were used. Further, differences between groups were examined with general linear models (GLMs), adjusting for sociodemographic (gender, age) and diabetes-related characteristics (duration of diabetes, BMI, HbA1c, risk factors), respectively.
Results: Patients' characteristics for GLA (47% female) and DET (51% female) groups were (mean ± SD): age: 66±10/65±10 yrs., BMI: 31.3±5.8/32.7±6.2 kg/m^2, HbA1c: 7.5%±1.2/7.7%±1.2, fasting blood glucose: 142±47.7/149±49.0 mg/dl. Diabetes duration (> 10 yrs.: GLA 60%, DET 59%), onset of first insulin therapy (> 5 yrs.: GLA 62%, DET 64%), diabetic complications and risk factors were equally distributed in both groups. Treatment experiences and satisfaction analyses were conducted with data from 1,718 per protocol patients (GLA: 1,141; DET: 577). ITEQ subscales (sleep, diabetes control, weight control), ITEQ total score differed between insulin groups and were clearly better ($p< 0.05$) in GLA group (ITEQ total score: 68.6±12.7 vs. 66.7±13.9, p=0.004). Differences in DTSQs total score failed to reach statistical significance (28.8±5.9 vs. 28.2±5.8, p=0.064) Results of the GLMs indicate that differences between the insulin groups were stable after adjustment.
Conclusions: Under real life conditions, our results indicate that glargine was associated with significant higher treatment experiences as well as treatment satisfaction compared to detemir among T2D patients treated in a basal-bolus regimen.

Conflict of interest:
Employee: Franz Hessel
Commercially-sponsored research: Thomas Kohlmann, Joern Moock

D-0963

Lower treatment costs with insulin glargine compared to insulin detemir as part of a basal-bolus regimen in type 2 diabetes: results of the LIVE-COM study in Germany

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Aims: The basal insulin analogs glargine (GLA) and detemir (DET) are recommended drugs in main national and international guidelines for the treatment of diabetes. In addition to clinical aspects the economic impact of

such basal insulin analogs on healthcare expenditures is of importance. The aim of this study was to compare resource utilization and costs incurred by a basal-bolus insulin regimen in type 2 diabetes (T2D) patients using either GLAR or DET from the perspective of the Statutory Health Insurance (SHI) in Germany under real-life conditions.

Methods: LIVE-COM was a non-interventional, cross-sectional, retrospective study performed between April and September 2008 in randomly selected primary care practices in Germany. T2D patients with SHI status were eligible for documentation if aged ≥18 years and either using GLAR or DET as part of a basal-bolus regimen for ≥6 months prior to documentation. The primary objective was to compare mean direct diabetes-specific treatment costs (DTC) between GLAR and DET groups over 6 months. DTC comprised antidiabetic medication (insulins, OADs), needles, self-monitoring of blood glucose (test strips, lancets), and hypokits to treat severe hypoglycaemia. Mean costs were adjusted for relevant influencing factors by analysis of covariance (ANCOVA).

Results: LIVE-COM enrolled 1731 T2D patients (GLA, 1150; DET, 581) from 138 primary care practices. Patient characteristics for GLA (53% male) and DET (49% male) groups were (mean±SD): age (66.0±10.7 vs. 64.7±10.1 years; p<0.01), BMI (31.3±5.8 vs. 32.7±6.2 kg/m^2; p<0.01), HbA1c (7.5±1.2 vs. 7.7±1.2; p<0.01), and fasting blood glucose (140±46 vs. 148±48 mg/dl; p<0.01). Diabetes duration (>10 years: 60 vs. 59%; ns), onset of first insulin therapy (>5 years: 61.6 vs 64.4%; ns), and number of diabetic complications and risk factors (3.0±1.7 vs. 2.9±1.6; ns) were similarly distributed in both groups. Adjusted mean DTC per patient and 6 months were lower for GLA compared to DET group (€ 932 vs.1060; p<0.01). Adjusted average DTC savings per patient were 128 € (95% CI: [90, 167]; p<0.01). Adjusted mean single costs for GLA and DET groups were: basal insulin € 223 vs. 246 (p<0.01), bolus insulin € 241 vs. 289 (p<0.01), needles € 67 vs. 80 (p<0.01), test strips € 347 vs. 393 (p<0.01), lancets € 14 vs. 16 (ns), OADs € 37 vs. 36 (ns), and hypokits € 2 vs. 1 (ns). Mean daily total insulin dose of 27.7/40.3 U (basal/bolus) was found to be lower for GLA group compared to 32.1/47.1 U for DET group (p<0.01). GLA patients had fewer basal insulin injections per day (1.1 vs. 1.3; p<0.01) and required also less test strips (3.2 vs. 3.6; p<0.01). Reported hypolycaemic events, hospitalization rates and frequency of physician contacts did not differ between GLA and DET groups.

Conclusion: Under real-life conditions, a glargine vs.detemir based basal-bolus regimen was associated with lower costs of diabetes care from the SHI perspective in a head-to-head comparison in T2D patients.

Conflict of interest:
Advisory board: R. Holle, T. Kohlmann and RA Bierwirth are members of LIVE-COM advisory board and received consulting fees from sanofi-aventis for scientific advising
Employee: W. Landgraf and K.-H. Theobald are employees of sanofi-aventis Germany
Other substantive relationships: The study was supported by sanofi-aventis, Germany

D-0964

Dose response of recombinant human hyaluronidase effects on pharmacokinetics of regular human insulin and insulin lispro following SC injection

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Aims: Recombinant human hyaluronidase (rHuPH20) is a locally and transiently acting enzyme that catalyzes depolymerization of hyaluronan, thus reducing the barrier to local bulk fluid flow and increasing the permeation of coinjected drugs. In the case of insulin, rHuPH20 results in acceleration of pharmacokinetic (PK) and glucodynamic (GD) responses for both regular human insulin and insulin lispro, resulting in an "ultrafast" insulin profile. This euglycemic clamp study compares the PK and GD responses to SC regular human insulin (regular) ± coinjected recombinant human hyaluronidase across a range of concentrations of rHuPH20.

Materials and methods: Separate cohorts of 4 healthy adult volunteers fasted for 10 h prior to receiving either 3 U or 12 U of regular human insulin or 1.5 U or 6 U of insulin lispro at time 0. Each subject received all 6 concentrations of rHuPH20 during 6 separate clamp visits; rHuPH20 concentrations employed were 0, 1.25, 5, 10, 20 and 80 µg/mL for regular and 0, 0.08, 0.32, 1.25, 5, and 20 µg/mL for lispro. Subjects had their glucose regulated to a value 90% of spontaneous fasting level with a variable rate glucose infusion. Samples were collected for PK at frequent intervals (24 samples over 8 h).

Results: All subjects completed the 6 clamp procedures, and PK data are presented for both insulin doses. PK parameters were analyzed using an ANOVA model with fixed effects for dose (i.e., 3 U insulin, 12 U insulin, 1.5 U Lispro and 6 U Lispro) and PH20 concentration. An unstructured covariance matrix among repeated observations for each subject was assumed. Coadministration with rHuPH20:

- increased the geometric mean peak insulin concentration (Cmax), at PH20 concentrations = 0.3 µg/mL with full effect obtained by 5 µg PH20/mL.
- increased geometric mean early insulin exposure (AUC from 0 to 30 minutes), at all PH20 concentrations with full effect obtained by 1.25 µg PH20/mL.
- shortened time of offset (Late $t_{50\%}$), at all PH20 concentrations with full effect obtained at the highest level tested, 80 µg PH20/mL.
- slightly increased total bioavailability (AUClast) overall, although the effect did not reach significance for any dose relative to control, with the full effect obtained by 5 µg PH20/mL.

Conclusions: rHuPH20 is a potent permeation enhancer, enhancing insulin over a wide concentration range 0.08 to 80 µg/mL, with an optimum effect at or about 5 µg/mL.

Conflict of interest:
Stock ownership: DM, LG and DV have options or shares in the sponsoring company, Halozyme Therapeutics, Inc.
Employee: DM, LG and DV are employees of the sponsoring company, Halozyme Therapeutics, Inc.
Other substantive relationships: EL is a paid consultant of the sponsoring company, Halozyme Therapeutics, Inc.

D-0965

Treatment of impaired glucose tolerance with buccal spray insulin: a novel approach

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Background and aim: Postprandial hyperglycaemia is the consequence of a reduced first phase insulin response after a meal. This condition has been associated with an increased risk of cardiovascular events and mortality. Subjects with postprandial hyperglycaemia often present with co-morbidities such as dyslipidaemia, hypertension, abdominal obesity, microalbuminuria, endothelial dysfunction and markers of visceral inflammation. Normalization of the first phase insulin response using fast acting insulin is an attractive option. The objective of this phase II study was to investigate the efficacy and safety of treatment with buccal spray insulin (Oral-lyn™)on post-prandial plasma glucose and insulin levels in subjects with impaired glucose tolerance (IGT).

Methods: A total of 20 Caucasian subjects, mean age 48.7 ±14.3 SD years, a body mass index of 32± 6 Kg/m2, 13 females and 7 males, with confirmed IGT were included in the study. Subjects were randomized to take 4, 6 or 12 Oral-lyn™ puffs, split in two equal doses each, one before and the second 30 minutes after a standard 75 g oral glucose tolerance test (OGTT). Glucose excursions and insulin levels were measured at baseline and 30, 60, 90, 120, 180 min following OGTT.

Results: There were no significant differences in plasma glucose levels during OGTT with 4 or 6 puffs compared to OGTTs performed without insulin administration. Treatment with 12 Oral-lyn™ puffs (equal to 12 IU) was followed by a significant 29.6% decrease in mean plasma glucose at two-hours (from 175.3± 14.0 to 124.0±39.1 mg/dl), and a 26.8% decrease at three-hours (from 124.7±50.5 to 91.3±26.0 mg/dl), altogether p=0.01. Considering all time points of the OGTT up to 180 min, there was a mean reduction of 15.8% in plasma glucose levels. There was a trend for increased insulin (µU/L) levels at all time measurements. Finally, no adverse events were observed in the course of the OGTT and, most relevant, no hypoglycaemic episodes were reported at any time-points by the participating subjects.

Discussion/conclusion: This proof of concept study demonstrates that treatment with buccal spray insulin is a simple and valuable treatment for reducing postprandial hyperglycaemia in obese subjects with IGT. Importantly, this treatment is safe and none of the study subjects experienced hypoglycaemia. Therefore, the use of insulin administered through an alternative route such as the buccal mucosa can represent a novel approach for treatment of postprandial hyperglycaemia.

No conflict of interest

D-0966

Study of oral administration of insulin in a hydrogel form to a non-diabetic and diabetic rodents

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Objective: To evaluate the effect of a new insulin preparation in hydrogel form, in diabetic and non diabetic rodents.

Method: A new hydrogel form containing rapid acting insulin was tested through four different experiments in rodents (Wistar rats and Balb/C mice) by oral administration. Diabetes was induced by STZ. The new formulation was designed to allow the delivery of insulin in a sustained form, avoiding serum peaks, as cylindrical pellets of 3 mm diameter, containing 3IU/cm. The amount of insulin administered by mouth was 4 IU/kg of body weight. Hydrogel pellets mainly consist of an aqueous solution of an acrylic monomer polymerized by gamma radiation.

The four experiments were carried out as follows:

a. administration of oral insulin to non-diabetic mice
b. administration of oral insulin seized in hydrogel form to non-diabetic mice,
c. administration of oral insulin seized in hydrogel form to diabetic rats and
d. like c) with food every 6 hours.

Results: The experiments show that in a lineal plot of glycemia (Gl) in mg/ml versus time in min, exp.(a) shows a constancy of Gl in 100 in a period of 200 min and exp(b) shows a decrease of Gl to nearly 50 in 30 min and normalization after that time. In exp. (c) Gl starts at 350 decreasing steadily to less than 20 for a period of 20 hrs. Finally exp(d) shows a decrease from around a Gl value of 500 that could be controlled by systematic oral administration of insulin with food.

Administration of insulin in hydrogels to non-diabetic mice displays significantly glycemic control when comparing experiments b) and a).

When insulin is administered to diabetic rats as in hydrogel form, it showed a quick reduction of glycemia up to hypoglycemic levels, lasting more than 20 hours. In the case of administration of insulin in hydrogel with food, the control of glycemia was smoother and gentler and can be controlled by the amount of drug seized into the polymer.

Conclusion: Administration of insulin as a long lasting oral hydrogel preparation markedly reduced glycemic level in the studied rodent models.

No conflict of interest

Pregnancy: epidemiology, outcomes and management

D-0967

Incidence of perinatal complications in women with gestational diabetes controlled with diet who do not perform self blood glucose monitoring

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Introduction: Appropriate therapy for gestational diabetes mellitus (GDM) can decrease fetal and maternal morbidity. However, there is still no consensus if it is necessary to treat those women with "mild" GDM. GDM treatment consists of diet, self blood glucose monitoring (SBGM) and insulin if necessary. Because of limited resources in Brazil, many women whith GDM can not afford SBGM. Those who control diabetes only with diet are frequently just monitored through weekly laboratory tests and ultrasound.

Objective: The goal is to identify which patient who is on diet, without self monitoring, had a higher incidence of complications, in order to identified those who need more rigorous treatment.

Methods: It was performed a retrospective study through review of medical records from women diagnosed with GDM followed in a Brazilian public maternity between 1999 and 2005. GDM diagnoses were made based on the American Diabetes Assotiacion criteria. Those who needed to use insulin were excluded from the analyses. The risk variables were age, parity, mean fasting plasma glucose (FPG), mean post prandial plasma glucose (PPG), gestational age of GDM diagnostic (GA), prior history of gestational diabetes, weight gain after second trimester of pregnancy, pre-pregnancy body mass index (BMI), family history of diabetes and prior history of gestational diabetes. It was applied Student t-test for mean comparison of the continuous risk variables and Pearson Chi-Square for categorical risk variables.

Results: The sample is composed of 72 women, 44 cases (61%) do not develop complications. One case with twins was excluded. There were no maternal complications in our sample. The main fetal and neonatal complications were: hypoglycemia (12 cases), large for gestational age (12 cases), congenital malformations (4 cases), neonatal infection (4 cases), hyperbilirubinemia (4 cases), prematurity (1 case), coagulation disorder (1case), polycythemia (1case), hemangioma (1case). Pregestational BMI showed a significant association with perinatal risk (26.8 ±4.9 kg/m^2 vs 31.6 ±5.4 kg/m^2)($p < 0.05$). Patients who developed perinatal complications did not differ from women without complications in age (31.1 ± 5.7years vs 31.3 ± 5.0 years), parity (2.8 ± 1.8 vs 2, 9 ± 1.4), mean FPG (92.6± 11.3 mg/dL vs 101.9 ± 33.7mg/dL), mean PPG (111.7 ± 24.3mg/dL vs 110.8 ± 32.5 mg/dL), GA at GDM diagnosis (27.1± 5.2 weeks vs 25.9 ± 6.9 weeks) and weight gain (8.4 ± 4.7 kg vs 7.8 ± 4.4 kg). Family history of diabetes and prior history of gestational diabetes weren´t associated with worst outcomes.

Conclusion: We concluded that obesity may be a marker of risk of perinatal complications that more features of decompensated diabetes in women with mild GDM. Therefore, we must be more aware of the possibility of unfavorable outcomes in this group of women and encourage as far as possible the implementation of SMBG.

No conflict of interest

D-0968

Comparative study of three insulin schedules in pregnant insulin-treated diabetic women

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Aim: To compare the effects on metabolic control, maternal and perinatal outcomes of 3 intensive insulin treatment schedules in pregnant insulin-treated diabetic women. The acquired information will allow individualizing the management of the diabetic pregnant women and to optimise the availability of different insulin preparations.

Study design: 84 pregnant women with pregestational diabetes requiring insulin treatment were included in one of 3 schedules of insulin treatment in the Central Service of Diabetes & Pregnancy, Havana, Cuba. In the 3 schedules, regular insulin (Actrapid HM Novo Nordisk) was used before breakfast, lunch and dinner; the difference was in the fourth dose of insulin: regular insulin at 3:00 a.m.(4-6 Units), intermediate insulin (Insulatard HM Novo Nordisk) at 10 pm. (1/4 of the daily dose), and intermediate insulin at 6 pm. (1/3 of the daily dose). The initial total daily dose was calculated according with the type of diabetes and initial degree of metabolic control. The effectiveness of metabolic control was measured by glycemic profiles (3 am, 7 am, 10 am, 2 pm, 8 pm), average value of Hb A1c and maternal weight gain.

Results: The achievement of adequate metabolic control through pregnancy was similar in the 3 therapeutic groups. Glycemia in different moments of the day showed the lowest values of fasting glycemia (7 am) in the users of intermediate insulin at 10 pm., the lowest values of glycemia at 3 a.m. with intermediate insulin at 6 p.m. and the highest values of glycemia at 3 a.m. with regular insulin at this hour. The highest frequency of hypoglycaemia was found in the users of intermediate insulin at 6 p.m. The 3 shedules showed similar results in maternal and perinatal outcomes.

Conclusion: The 3 schedules of intensive insulin treatment gave the desired maternal and perinatal outcomes. The method of intermediate insulin at 10 p.m. provides more acceptable glycemic values, although give longer hospital stay.

No conflict of interest

D-0969

HbA1c, fasting, postprandial glycemia and infants' birth weight in patients with type 1 diabetes

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Aim: of the present work was to reveal correlation between glycemia indices in pregnant patients with type 1 diabetes mellitus (T1DM) and their infants' birth weight (IBW).

Methods: Totally, 178 pregnant women with T1DM were enrolled in the study (mean age - 27±7yrs; diabetes duration – 11.2± 5.4yrs). Patients with nephropathy were excluded. Strict metabolic control was maintained and fetal surveillance was performed throughout the pregnancies. Data obtained for home-blood glucose monitoring (five-point profiles), postprandial (PG), fasting (FG), mean blood glucose (MG) were analysed. Healthy infants were born to diabetic mothers at 38-40 week of gestation. According to the IBW, the patients were divided into 2 groups (GR): GR.1, n=127, IBW < 4 000g;Gr. 2, n=51, IBW >4 000g.

Results: HbA1c (%), PG, FG and MG (mg/dl) levels were statistically higher in GR.2, than in Gr.1: HbA1c (7.2 ±1.38 vs 6.1± 1.71, P<0.001), PG (168.1± 17.1 vs 110.4± 14.7, P=0.000), FG (136.5 ±15.8 vs 102.5± 13.4, P=0.000), MG (155.2 ±12.17;vs 104.7± 12.1, P=0.000). Pre-pregnancy BMI (kg/m2) indices were higher in Gr.2, than in Gr.1 (27.2± 0.58 vs 22.5± 0.62, P<0.001). Strong correlation was observed between IBW and PG (r-0.882; P=0.000), IBW and HbA1c (r-0.794;P=0.04), IBW and MG (r-0.703;P=0.012) for Gr.1, and between IBW and PG (r-0.814; P=0.000), IBW and pre-pregnancy BMI (r-0.866; P=0.001) for Gr.2.

Summary: IBW strongly correlates with PG, MG and HbA1c in the pregnant patients with T1DM. Pre-pregnancy BMI>26kg/m2 and postprandial glycemia levels of >160mg/dl may predict fetal macrosomia.

No conflict of interest

D-0970

What do we know of gestational diabetes ? (medicine based on the evidence)

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Aim: Since Miller in 1946 reported a perinatal mortality 4 times greater than normal in women that developed Diabetes later on, there are many publications that still discuss proceeding diagnosis and repercussion of the Gestational Diabetes.

Patients and method: We analyze our experience from 1968-2007 with 2 238 Gestational Diabetics regarding frequency, used diagnosis, factors of risk in our population, repercussion on maternal and perinatal morbi-mortality and other variables of importance.

Results: The frequency of Gestational Diabetes in our population is 4,5%. As for maternal and perinatal morbi-mortality it has been superior significantly to that reported by our institution for population without selecting. The risk factors more frequently detected in our population have been: a.- maternal age = or > 30 years old, b.- corporal overweight > 26,0 (BMI) and c.- diabetic relatives or 1erst line. As screening we have used the fasting glycemic value = or > 80 mg/dl (4,4 mmol/L). The diagnostic method used has been the oGTT one advised by WHO, because we don`t detect differences with coming from J. O`Sullivan. The control approach "good" during pregnancy it has been fasting glycemic value = or < 94 mg/dl (5,2 mmol/L) and post-prandial 2 hours = or < 114 mg/dl (6,3 mmol/L). The frequency of glucose intolerance of variable intensity post childbirth has been 23% at 6 years of the event.

Conclusion: The biggest risk in Gestational Diabetes consists of underestimating it.

No conflict of interest

D-0971

Diabetic women in fertile age: gynaecological, obstetric and contraception history

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Background and aims: It is well established the necessity to obtain strict metabolic control before conception in order to reduce the frequency of congenital malformations in newborns of women with diabetes. In expectance of these metabolic conditions, the same as the presence of complications that dissuade pregnancy require adequate contraceptive use and efficient diabetological and sexual education.

Materials and methods: With the aim to know gynaecological, obstetric and contraception history, we interviewed all the women with diabetes in fertile age (14-45 years old) from 2 primary care areas of Havana City, Cuba: 65 patients, 19 type 1DM and 46 type 2 DM. We make a questionnaire designed with this purpose (pregnancies, deliveries, abortions, macrosomics, underweight newborns, congenital malformations, perinatal deaths, previous and actual use of contraception), gynaecological examination and vaginal smear.

Results: The half of the women had gynaecological problems, mainly vaginal discharge (leucorrea); the most frequent germ was Candida albicans. The frequency of pregnancies and newborns was significantly higher in women with type 2DM, compared with type 1. There was a high frequency of macrosomic newborns (23,5% vs. 5%) and congenital malformations (13,9% vs. 2,1%) in group of women with diabetes, compared with general population attended in Ramon Gonzalez Coro Hospital. There were not statistical differences of the gynaecological and obstetric history with previous investigations in the not diabetic women. There were 23 sterilized women (35,4%). Another frequent contraceptive method was the intrauterine device (21,5%). Near one third of the total group did not use any contraceptive method at the moment of the study (21 women for 32,3%).

Conclusion: We confirm deficient policy in the contraceptive control of the women with diabetes in reproductive age, with inadequate education to the patient with diabetes and her family in topics as pregnancy and sexuality.

No conflict of interest

D-0972

Pattern of gestational weight gain in women with or without gestational diabetes: impact on birth weight

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Gestational diabetes (GDM) and excessive gestational weight gain both have significant implications for the health of mother and child.

Aim: To compare patterns of gestational weight gain between women with GDM and women without GDM (controls).

Methods: Data were collected on maternal and neonatal outcomes by detailed retrospective reviews of medical records in women who delivered between January and December 2007 at the Centre Mère-Enfant, Laval University Medical Center (Quebec, Canada). Analysis included 165 women (40 GDM and 125 controls) for whom gestational weight gain was calculated by the difference between maternal weight measured at delivery, or at the last prenatal visit (≥37th week), and pre-pregnancy self-reported weight. Weight gain rate was also calculated for the entire pregnancy. Gestational weight gain was compared to the recommendations by the Institute of Medicine (IOM). GDM women were diagnosed and treated according to the Canadian Diabetes Association guidelines.

Results: Women with GDM had a significantly higher pre-pregnancy body mass index (BMI) compared to controls (28.6±8.1 vs. 23.7±4.5 kg/m^2, p<0.001). Total gestational weight gain was not significantly different in

GDM women compared to controls (13.4±5.4 vs. 15.4±5.4 kg, p=0.12). The proportion of women exceeding IOM recommendations was not significantly different in GDM compared to controls (40% vs. 50%, χ^2=1.13, p=0.56). Total gestational weight gain was positively associated with child birth weight (r=0.25, p=0.002) and women exceeding IOM recommendations delivered significantly heavier babies compared to women within or below IOM recommendations (3666.4±403.5 vs. 3530.4±348.1 and 3351.7±328.1 g respectively, p=0.001). A trend for a lower weight gain rate was observed in women with GDM compared to controls during the entire pregnancy (0.36±0.15 vs. 0.41±0.14 kg/wk, p=0.06). First trimester weight gain was not different in GDM compared to control women (2.27±2.65 vs. 1.51±2.26 kg, p=0.26). In contrast, weight gain was significantly lower in GDM compared to controls in the second (4.08±2.32 vs. 4.90±1.86 kg, p=0.03) and in the third trimester (3.19±2.14 vs. 5.44±2.44 kg, p<0.0001). Second and third trimester weight gain were both positively associated with child birth weight (r=0.23, p=0.006 and r=0.23, p=0.004 respectively). No association was found in the first trimester. Gestational weight gain was a significant predictor of elevated child birth weight independently of the presence of GDM (r^2=0.07, p=0.001).
Conclusion: GDM women are characterized by an elevated pre-pregnancy BMI and lower weight gain in the second and third trimester compared to women without GDM. Women exceeding current weight gain recommendations delivered heavier babies independently of GDM.

No conflict of interest

D-0973

Gestational Diabetes Mellitus(GDM): we need to revise the standard criteria for diagnosis - Indian experience

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Aim: To study the clinical profile of women with glucose intolerance of varying degree during pregnancy & to evaluate whether we need to reduce the cut off values given in Carpenter & Coustan & ADA criteria for diagnosis of GDM. [i.e.100 g OGTT – F 95, 1hr 180, 2hr 155, 3hr 140 mg%, if any 2 values are abnormal.]
Material and method: 781 pregnancies with glucose intolerance of varying degree were divided as – GDM (as above) and Decreased Gestational Glucose Tolerance [DGGT– if two hours BG is between 120-155mg% or if any one value is abnormal in OGTT]. All cases were treated with diet & /or insulin to achieve fasting BG < 90 mg% & 2hr PPBG < 120 mg% and followed till delivery. Age, Anthropometry measures, Family History(F/H), Bad Obstetric history (BOH), Insulin Requirement were compared with the fetal out come and is observed as below.
Results: TOTAL GDM DGGT
781 493 (63.1 %) 288 (36.8 %)
Mean Age (years) 28.8 ± 3.96 28.4 ± 4.07
Weeks of Diagnosis 24.6 ± 8.5 24.9 ± 7.4
Pre Pregnancy BMI (Kg/m2) 23.9 ± 4.0 23.4 ± 3.5
Positive Family History 332 (67.3 %) 175 (60.7 %)
Bad Obstetric History (BOH) 211 (42.7 %) 131 (45.4 %)
Patients on Insulin at Full Term 300 (60.8 %) 82 (28.4 %)
Fetal outcome:
Macrosomia 27 (5.47 %) 12 (4.1 %)
Neonatal Hypoglycemia 60(12.1 %) 14 (4.8 %)
Hyperbilirubinemia 24 (4.8 %) 11 (3.8 %)
Fetal Loss 33 (6.6 %) 11 (3.8 %)
The difference between mean age, pre pregnancy weight, body mass index & weeks of diagnosis of glucose intolerance in 2 groups were statistically not significant. 63.1 % were GDM while 36.8 % had DGGT. 60.8 % of GDM women & 28.4 % of DGGT women required insulin to achieve euglycemia for pregnancy. 42.7 % of GDM & 45.4 % of DGGT women had past history of BOH, the incidence of which reduced to 6.6 % & 3.8 % respectively.
Conclusion: If we follow the standard criteria for diagnosis of GDM, 36.8% of pregnancies would have remained undiagnosed & untreated for glucose intolerance. Due to aggressive management we could reduce the incidence of fetal loss from 45.4 % to 3.8 % in DGGT group as that of GDM. We recommend that all women with 2hr. value of OGTT more than 120mg%, but not GDM by standard diagnostic criteria, should be categorized as, "Decreased Gestational Glucose Tolerance (DGGT)", to achieve better fetal outcome.

No conflict of interest

D-0974

Effect of a community-based lifestyle intervention on physical activity and diet in pregnant women

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Obesity is a modifiable risk factor for type 2 diabetes. Maternal obesity is associated with future obesity and type 2 diabetes in mothers and their offspring. We conducted a community-based lifestyle intervention for pregnant women in Winnipeg. Pregnant women (<20 weeks of pregnancy) were recruited with assistance from the Healthy Start for Mom & Me Prenatal and Postnatal Program, and randomized into Intervention (IG) and Control Groups (CG). Participants in the IG received instructed group and home exercises for 3-5 times/week, and computerized Food Choice Map dietary counseling. Participants in both groups received 2 surveys for activity and diet at baseline and 2 months after enrolment (post-intervention), and a post-partum visit. A total of 131 women completed the program (67 in the IG, 64 in the CG). No significant difference was detected in age, ethnicity, family income, pre-pregnant weight, baseline physical activity index and nutritional intakes between the groups. Self-reported physical activity at post-intervention was greater than that of IG at baseline (p<0.001), but not in the CG. Fat intake by participants in the IG at post-intervention was lower than that in the CG (p<0.05). Excessive weight gain during pregnancy was found in 29% of the IG and 48% of the CG (p=0.10). Prevalence of gestational diabetes, the requirement for delivery procedures and macrosomia were 6%, 10% and 19% in the CG, and were 2%, 5% and 12% in the IG (not statistically significant). The results suggest that lifestyle intervention during pregnancy effectively improved activity and diet, and potentially decreases excessive weight gain in pregnant women (supported by Lawson Foundation and CIHR).

No conflict of interest

D-0975

Prevalence of gestational diabetes mellitus and maternal height

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Background: Short maternal stature is one of the reported factors associated with increased prevalence of gestational diabetes mellitus (GDM) in different ethnic groups.
Aim: To find out the prevalence of GDM in a sample of Bulgarian women according to their height and to analyze the association between maternal stature and gestational diabetes.
Methods: We studied a sample including 189 consecutive pregnant women who underwent 2-h 75-g OGTT as a part of universal screening program (for GDM diagnosis WHO-1999-criteria were applied) and 18 additional patients with out-of-screening diagnosed GDM. At enrollment, after signing a written informed consent approved by the Local Ethic Committee, a standardized questionnaire was completed, an anthropometry (weight, height) obtained, plasma glucose at 0', 60', 120' was measured using glucose-oxidase method.
Results: We found 11,6% prevalence of GDM (22 women) in the whole sample of 189 screened women. All 189 women are stratified into five groups according to intervals of maternal height and a prevalence of GDM in each group is determined: < 155cm (50%); 155-159cm (13,3%); 160-164cm (12,7%); 165-169cm (10,6%), > 170cm (7,4%). Then all pregnant women are stratified into two groups: with GDM (22 from the screening and 18 out-of-screening) and a second group with healthy women (N=167). Study population details (GDM women vs. healthy) are as follows: age (30,3±5,2 vs. 28,6±4,3; p=0,05); gestational weeks (27,6±5,7 vs. 27,8±3,7; p=0,5); pre-pregnancy BMI (26,1±6,0 vs. 22,5±5,0; p<0,0001); height (1,62±0,06 vs. 1,65±0,05; p=0,008). Pearson correlation coefficients for maternal height with fasting, 1-h and 2-h plasma glucose are -0,13 (p=0,05), -0,14 (p=0,04), -0,2 (p=0,005), respectively.

Discussion: Maternal height is significantly lower in GDM women. Consistent with this finding, the prevalence of GDM increased with decreasing stature being highest in the interval with lowest height. Maternal stature shows inverse weak significant relation with 1-h and 2-h post-load glycaemia. The role of short maternal stature as another possible risk factor for GDM should be explored further.

No conflict of interest

EDUCATION

Adult and youth empowerment

D-0976

A structured diabetes self-management education program in Hong Kong: Process and outcome evaluation

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Background: A structured diabetes self-management education (DSME) program using patient empowerment approach was developed, implemented and evaluated by the Association of Hong Kong Diabetes Nurses (AHKDN). Based on the Michigan Empowerment Model and education strategies appropriate for Chinese culture, AHKDN developed the structured program with a teaching kit which contains: a set of slides with scripts, a log book and a hand book. Four diabetes nurses implemented the program (three 4-weekly sessions) in 4 diabetes centers. This paper reports the process and outcome evaluation of the program.
Methods: A single, embedded case study design (with 8 embedded units representing main data sources) was employed to evaluate the program. All units together provided a comprehensive evaluation of the case using multiple-triangulation. The patients (n=40), facilitators (n=4) and observers (n=10) contributed to the three samples of participants of the study. Data collection methods included audio-taping of the education process, reflective diary written by facilitators and observers, questionnaires and scales administration, home-work by patients, glycaemic levels measurements, and focus-group interviews with the three samples. In line with the case study design, there were two stages of data analysis – within-unit and cross-units analyses.
Results: Key findings of within-unit analysis show that patients, facilitators and observers were highly satisfied (mean score=70-100%) with the program. Patients showed high engagement (score>90%@session). Every patient set diabetes goals (mean no.=2.8) and performed SMBG (mean days=8.5). Patients showed significant improvement in i) diabetes specific psychosocial self-efficacy, ii) diabetes knowledge (gain by 28%), and iii) A1c levels (reduction by 0.5%). In cross-unit analysis, the converged themes confirm important insights on the implementation of DSME: i) content – practical and accurate information, peer sharing, support and role modeling, and opportunity to practice and receive feedback are important, ii) method - multiple education strategies, home work assignments and goal setting are useful to enable patients' participation, interaction and experimentation with DSM; iii) by whom – program facilitators should have a good mastery of DSME, problem solving and group facilitation skills, and willingness to work as equal partners with patients.
Conclusions: This is the first structured DSME program tested among Chinese type 2 diabetic patients (> 650,000) in Hong Kong. Findings show that the program, an attempt to apply patient empowerment with Chinese patients, is successful in improving self-efficacy, self-management behavior and glycaemic control.
AHKDN will continue to advocate and promote high quality DSME in Hong Kong.

No conflict of interest

D-0977

Chinese patients' perceptions of diabetes self-management education: a case study of a patient empowerment program

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Aim: This paper reports patients' perceptions of diabetes self-management (DSM) education, which were part of the findings of a case study that evaluated the education process of a patient empowerment program undertaken in Hong Kong.
Methods: A single, embedded case study design was employed to evaluate a patient empowerment program. It was designed with three-monthly sessions (n = 8 hours). Four courses of the program were each facilitated by one diabetes nurse (facilitators, n = 4) to a group of 10 patients (n = 40) with type 2 diabetes. The program was observed by 9 diabetes nurses and one doctor (observers). The facilitators, patients and observers contributed to the three samples of participants of the case study. Eight embedded units of analysis together provided a comprehensive evaluation of the case using multiple-triangulation. Data collection methods included audio-taping of the education process, reflective diary written by facilitators and observers, questionnaires and scales administration, work-books recorded by patients, A1c levels retrieved from patient records, and focus-group interviews with the three samples. There were two stages of data analysis – within-unit and cross-units analyses. This paper focuses on one of the units – patient focus-group interview data. The interview was attended by a sub-sample of 8 patients who were participants of one of the courses, using convenience sampling method. The interview, taped and transcribed verbatim, was facilitated by one of the researchers using a semi-structured guide.
Results: Thematic analysis of patients' focus-group data yields two categories: (1) perceptions of abilities required for DSM, and (2) perceptions of the empowerment program. The first category has four subcategories: diabetes-specific medical knowledge and skills, perseverance and internal motivation, coping with negative emotion and stress, and obtaining support from family and health professionals.The second category has four subcategories: the facilitator's professional expertise, experiential learning, peer input and collaborative learning, and length and content of the program. Findings from the eight units of analysis converge and validate each other that the program was implemented in line with the philosophy of patient empowerment.
Conclusion: Limited investigation has been directed to examine Chinese patient perceptions of the abilities required for DSM and their experience of such education process. The strength and limitation of this study will be discussed. Implications of our findings for facilitating empowerment programs in diabetes and other chronic care specialties will be discussed.

No conflict of interest

D-0978

Evaluation of a multidisciplinary diabetes school for people with type 2 diabetes in an out-patient clinic in Denmark

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Background: A published review (Deakin T el al, 2006) showed that patient-centred group education based on the principles of the empowerment philosophy resulted in improved health and HbA1c. In Denmark there has never been an evaluation of group education and therefore this randomised control study was conducted.
Method: Two different group education programmes were evaluated: programme A (10 hours) and programme B (14 hours including cooking and exercise). The two programmes were identical apart from cooking and exercise and were patient-centred and based on the empowerment philosophy.

The diabetes team doing the group education consisted of diabetes nurse specialist, dietician, chiropodist, physiotherapist and general practitioner (GP). The participants had individual consultations by the diabetes team including the diabetologist. At baseline and after half a year the participants completed validated questionnaires: Problem Areas in Diabetes Scale (PAID), Perceived Competence in Diabetes (PCD) and Treatment Self-Regulation Questionnaire (TSRQ). Demographic data, BMI, medication and blood tests were recorded.
Along with group education multiple risk factor interventions were made.
Results: 100 people with type 2 diabetes were referred from GPs. 90 (47 women) were included: 45 in programme A and 45 in programme B, mean age 59 years and duration of diabetes 45,2 months.
8,2 months after interventions there was a significant reduction ($p<0,001$) in PAID scale, HbA1c and blood pressure. PCD increased ($p<0,001$). Significantly more people were on lipid lowering medication, antiplatelet agents, insulin treatment and all were eating a healthy diet.
Programme A and B had the same effect on outcomes.
Conclusion: Multidisciplinary group education based on the empowerment philosophy and patient-centred education involving the person with diabetes actively combined with optimized dietetic and medical treatment resulted in significantly less problems in relation to living with diabetes and people felt empowered. These changes might translate into less diabetic complications and improvements in quality of life for people with type 2 diabetes.
The results are in accordance with the results in the above-mentioned review.

No conflict of interest

D-0979

Patient involvement in diabetes medication discussions: the effects of an educational intervention for UK nurse prescribers.

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Background: Better patient outcomes are reported when professionals engage in patient-centred care (Stewart et al 2000). As an important element of patient-centred care, provider-patient communication studies have indicated that routine medication discussions can lack depth and breadth (Stevenson et al 2000). Recently, UK guidance has recommended an increase in patient involvement during consultations to address non-adherence to medications (NICE 2009) and nurse prescribers have an important opportunity to promote patient involvement in their consultations with patients. However, evidence indicates that consultations are characterised by professionals' domination of medication discussions and one-way information giving (Shiu 2006; Latter et al 2007; Richard & Lussier 2007).
Aim: This paper presents results from an evaluation of an educational intervention for nurse prescribers to improve patient-centred medication discussion for people with diabetes. The paper draws on findings from a larger study funded by Diabetes UK (Latter, Sibley et al, 2009).
Methods: To assess changes in consultation participation, consultation audio-recordings were collected before and after (1 week, 3 months, 6 months) the nurse prescribers took part in an educational intervention. The intervention aimed to develop nurse prescribers' skills in patient-centred communication to support their exploration of patients' medication beliefs in practice. A consultation content assessment tool (MEDICODE: Richard & Lussier 2006) was used to examine levels of participation during routine prescribing consultations. Using a validated list of medication discussion themes, MEDICODE can quantitatively assess levels of consultation participation using two measures: the Preponderance of Initiative (POI) and Dialogue Ratio (DR).
Results: 154 consultation audio-recordings, from 14 nurse prescribers, provided 620 different instances of medication discussion. Across all discussion themes, the POI shifted significantly from the nurse prescriber to a shared initiative with the patient at all post-intervention time-points ($p<0.0001$). The DR did not change post-intervention. Assessments of POI & DR at the individual discussion theme level will be examined and post-intervention qualitative interviews with the nurse prescribers provide further insights about the intervention.
Discussion: The findings suggest a substantial move toward increased patient initiative during medication discussions following the educational intervention. At baseline, nurses were already engaging patients in dialogue, this may account for the lack of change in DR. The theoretical framework of the educational intervention offers potential to invoke a shift in health professionals' consultations towards a more patient-centred and empowering approach.

No conflict of interest

D-0980

Delivering successful diabetes self-management education across diverse cultures

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Auckland is New Zealand's largest city with a multi-cultural population that includes 11.1% Maori, 14.4% Pacific Islanders and 18.9% Asian people. It is estimated that almost half of the Asian population are from the South Asian nations.
Obesity, diabetes, and heart disease are rife, especially in these groups where numbers of Type 2 Diabetes are forecast to increase by 130-150%, (1996 – 2011). Language and cultural differences for Maori, Pacific and Asian people mean that often these groups do not access relevant health information delivered through conventional channels.
In recent years New Zealand's education for Type 2 diabetes has moved from secondary to primary care and there are many providers of Diabetes Self Management Education (DSME) utilising various programs.
Diabetes Auckland has been delivering successful Diabetes Self Management Education (*Healthy Living with Diabetes*) for many years and recently has tailored versions specifically for Maori, Pacific and Asian people. Careful selection of appropriate venues and incorporation of important cultural and spiritual customs (e.g. greetings, prayers, meeting closure) provides a comfortable environment that removes barriers to attendance. Visual food resources relevant to each culture are used throughout the food sessions.
Diabetes Auckland's presenters have a long history of independent diabetes education and now offer DSME under contract to a local Primary Health Organisation. In 2005 existing programs were re-designed to provide delivery that incorporates the principles of self-management, particularly action planning and problem–solving, as per the Stanford model. Further revisions, primarily of facilitation style, have followed by comparing the existing program to relevant education standards documented in the research literature.
The *Healthy Living with Diabetes* course is multi-session. Revision of material from each previous session occurs at the start of each new session, allowing integration and deepening of new knowledge. The sessions are jointly facilitated by a nurse and dietitian/nutritionist. One of these co-facilitators is drawn from the cultural group concerned.
Given that many participants speak English as a second language, a large number of visual and tactile resources are utilised and nutrition issues, including practical label-reading, have a high priority, providing approximately 40% of the content.
Analysis of attendance and retention data indicates that the program succeeds in reaching Auckland's unique cultural mix.

Conflict of interest:
Employee: Authors are employees of Diabetes NZ Auckland Inc

D-0981

Educating older adults with diabetes

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Aims: The purpose of this study was to qualitatively explore the perceptions, ideas, and experiences of clients with diabetes, over the age of 65 years, participating in a diabetes education program using a Conversation Map Tool™. These themes, accompanied by quotes from the transcripts, were presented to the fourth researcher, an expert in qualitative methods, for data verification.
Methods: Four Conversation Map™ group sessions were conducted at a Community Health Centre. Each group had six participants. Thirteen clients over the age of 65 years were recruited within one month following the completion of the Conversation Map Tool™. Participants were recruited as follows: four participants from Group one, three participants from Group two, two participants from Group three, and four participants from Group four. Participants reflected a maximum variation sample on several dimensions.

Participants ranged from having new diagnosis of Type 2 diabetes to living with diabetes for thirty years. Diabetes management ranged from lifestyle intervention to insulin administration. Participants' ages ranged from 65 to 82 years. Data was collected using individual interview with open-ended questions and probes. The interviews were audio taped and transcribed verbatim. The researchers then reviewed the transcripts for accuracy and completeness. Three researchers then independently read the transcripts looking for key words and themes. The team met to review their analysis and to identify the themes. These themes accompanied by quotes were then reviewed by a fourth researcher for data verification.

Results: Each group had six participants. Two predominant themes emerged from the data analysis. The first theme pertained to participants' perceptions of diabetes. Diabetes required life long learning and understanding the importance of self-care behaviors to manage diabetes. The second theme that emerged pertained to participants' learning during the Conversation Map™ session. Group learning occurred as a result of listening to others' experiences, sharing stories, and encouragement from others. Participants valued the Map, ease of use and lessons learned. Participants commented that a smaller group size and having individual maps along with large map might have facilitated their learning.

Conclusions: The Conversation Map™ was an effective tool to facilitate learning in older adults with Type 2 diabetes. Teaching older adults in a group setting utilized educator resources more efficiently while still maintaining a high quality of service. This qualitative study highlighted the effectiveness and benefits of group learning for older adults. This study provides support for further research using the Conversation Map tool in the younger adult population.

No conflict of interest

D-0982

Multidisciplinary workshops for parents of preschool children with diabetes

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Object: It is well known that parents of preschool children with diabetes have to deal with complex physiological and psychosocial needs of their children. Therefore we organized workshops to help them cope more effectively with diabetes regimen in order to improve glycaemic control and to enhance the psychological well being of families.

Method: Workshops were delivered in five small groups of 10 to 15 parents by a team of a pediatrician, diabetes nurse specialist and psychologist. There were two sessions each of 2 hours, in which three topics were addressed: adjusting insulin dose in special situations, providing special diet and managing behavior and adjustment difficulties in children.

37 mothers and 18 fathers completed two comparable versions of The Diabetes Knowledge Scales before and after the workshops. The parents perception of the improvement of their well being was evaluated by a questionnaire made for this purpose.

Results: Diabetes-related knowledge of parents increased significantly ($t=3,28$, $p<0.01$). After the workshop sessions all parents perceived themselves as less anxious and more confident about managing the diabetes of their children.

Conclusion: Structured muldisciplinary workshops are useful in improving diabetes-related knowledge, as well as the well being of parents. Interventions should be delivered by professionals with varying expertise who can deal with the special needs of each target group. Follow-up research is indicated to evaluate how often workshops are needed to maintain the improvements we found.

No conflict of interest

D-0983

Determinants of childhood and adolescent overweight and obesity in school going children in Karachi

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Aims: To determine the risk factors for overweight and obesity in school going children, with emphasis on canteen food consumption.

Methods: In 2007, we surveyed four private and two public schools. Data on the childrens' sociodemographic variables, dietary habits and physical activity patterns at the school, home and elsewhere were recorded, as well as their physical measurements (height, weight, anthropometry, presence of acanthosis nigricans). Multiple logistic regression was applied to assess the significance of each risk factor for primary outcome of overweight or obesity.

Results: Of the total of 530 children approached, 434 consented to enroll, of whom 14.1% were overweight or obese using the International Obesity Task Force Criteria: 13.8% boys and 14.4% girls ($p=0.84$). Of the non overweight non obese children, 159[42.6%] had waist size $\geq$ 71 cm, as compared to the 58 [95%] of overweight or obese children with waist size $\geq$ 71cm ($p< 0.05$). Acanthosis was documented in 12.4% children. Of the overweight or obese individuals, 27[44.3%] were documented to have acanthosis, while 34 [55.5%] were not. In the case of non overweight or non obese individuals, 27 [7.2%] had acanthosis, while 346 [92.8%] did not ($p<0.05$). Children bringing lunch and soft drinks from the canteen had significantly greater odds of overweight or obesity ([OR] 1.84, 95% [CI] 1.21, 3.45). Snacking while watching television and fast food visits more frequently than twice a week raised the odds of overweight or obesity by more than threefold ([OR] 3.32, 95% [CI] 3.23,4.79) and ([OR] 3.14, 95%[CI] 2.42,11.25], respectively. *The duration* of activity of $<$ 35 minutes versus $>$ 35 minutes per physical education [PE] class placed the child at greater odds of overweight or obesity ([OR] 2.84, 95% [CI] 1.27, 3.01), whereas the weekly *frequency* of PE classes did not achieve significance.

Discussion/conclusion: The school is well placed to initiate public health measures to prevent the epidemic of overweight and obesity in children that has evolved in the West. Children displaying acanthosis, a physical marker of insulin resistance representing a pre diabetic state, is a group requiring counseling for more rigorous and prompt institution of lifestyle modification. Despite facilities for physical education being available at the school, it was the duration of active participation per class that was associated with obesity, highlighting the need for better supervision by the coach. Efforts are required to educate children and their families about potentially modifiable high-risk behaviors, such as canteen food, eating during television watching, and engaging in physical activity at home and school, associated with overweight and obesity.

No conflict of interest

D-0984

Let's ask the experts! An experience with focus groups of diabetic adolescents to improve follow-up

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Introduction: Adolescence is often a crucial time for young diabetic patients. Adherence to treatment gets difficult and pubertal changes have a major impact on the control of their diabetes. This could also be observed among the diabetic adolescents seen at our outpatient clinic. We are seeking new strategies to improve this situation.

Aims and methods: Knowing the importance of participatory proceedings when taking care of young people, we proposed to work in focus groups (twice 10 adolescents) to allow them to express their needs. In order to develop new strategies, we created mixed groups including professionals, parents and adolescents.

Results: In the different focus groups the adolescents pointed out three major needs: 1. They want to be recognised as experts for their disease. They concretely suggested to be introduced to newly diagnosed diabetic children to share their experiences. They declared their availability for babysitting for diabetic infants through a mailing list. 2. They expressed their need to be motivated with new challenges to improve their compliance to treatment. They wished more opportunities to get in touch with other young diabetic people. 3. They considered the consultations boring and too repetitive and they want a change in the content.

Professionals and parents expressed also their needs which were compatible with the considerations of the adolescents, they mainly mentioned motivation and autonomy as being major difficulties.

Discussion: Based on the different propositions we partially modified our consultations and included a common breakfast, where they could meet each other for a time of discussion during their annual check-up. The adherence to this project was excellent (only two refused out of 30 adolescents). The discussions concerned important problems they have to deal with alcohol consumption, the aim of annual check-ups, difficulties to deal with parents and teachers worries concerning their diabetes. Following their wishes we organised also evening meetings with their friends and we are producing a movie explaining life with

type 1 diabetes. The interactions between younger and older adolescents are often a starting point for attitude changes or initiation of a new treatment, i.e. change from injections to pump. 90% of the participants said that they have learned something out of these discussions; 93% prefer this setting compared to individual consultations.

Conclusions: Our project was based on the empowerment of young people, confirmed by their wish to be considered as experts. When professionals look for new strategies to improve the situation of diabetic adolescents, it seems to be very effective to include them from the beginning in the process of change. Adolescents, parents and professionals have been able to develop different innovative strategies of follow up.

No conflict of interest

FOUNDATION SCIENCE

Pathophysiology of obesity

D-0985

Impaired gene expression of the human BRS-3 receptor in diabetic and obese state

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Aims: The orphan human Bombesin Receptor Subtype-3 (hBRS-3) is a member of the bombesin family, which is highly expressed in skeletal and cardiac muscle, brain and other several tissues. This G-protein receptor is implicated in energy metabolism, motility and tumor growth; although its function in physiological and pathological states remains unknown, BRS-3-knock-out mouse model develop obesity, hypertension and unbalanced glucose metabolism, suggesting a role of BRS-3 in glucose homeostasis. Here we explored the hBRS-3 gene expression level in the skeletal muscle of Type-1 (T1D) and Type-2 (T2D) diabetic and Obese patients (OB), compared to that in Normal subjects.

Methods: Pieces of skeletal muscle (120 mg) were obtained -previous informed consent given- from T1D (1F/2M; age: 74 ±1 yr; fasting plasma glucose: 129 ± 1 mg/dl; cholesterol: 146 ± 5 mg/dl; triglycerides: 165 ± 6 mg/dl), T2D (2F; 70 ± 9 yr; 126 ± 6 mg/dl; 148 ± 45 mg/dl; 167 ± 87 mg/dl), OB (1F/2M; 49 ± 6 yr; 130 ± 5 mg/dl; 206 ± 12 mg/dl; 172 ± 48 mg/dl; BMI: 46 ± 3 kg/m^2) patients and Normal (6F/1M; 44 ± 6 yr; 94 ± 2 mg/dl) subjects undergoing surgery performed with different purposes than that of this work. hBRS-3 gene expression -by RT-PCR- was studied; for each muscle sample, the hBRS-3 mRNA value was normalized with that of the housekeeping gene, 18s, and expressed as $2^{-?ct}$.

Results: In the muscle of T1D patients, hBRS-3 mRNA level was much lower (12.2 ± 1.1 times down-regulated, $p<0.0001$; range: 6.2-21.7) than Normal (range: 0.7-1.5). OB patients also showed a decreased ($p<0.0001$) muscle hBRS-3 gene expression, the value representing 5.6 ± 0.8 times down-regulated (range: 3.3-5.9) compared to Normal; and the same was detected in the muscle of the T2D group, where the level of hBRS-3 mRNA was 6.9 ± 0.9 times down-regulated (range: 5.8-7.5) respect Normal; the gene expression value of hBRS-3 in the T2D group was similar in magnitude to that in the muscle of OB patients. Although compared to Normal subjects the three groups of patients studied, T2D, T1D and OB, showed a significantly reduced muscle hBRS-3 mRNA, the value in T1D was much lower ($p<0.01$) than those respectively detected in T2D and OB patients (T1D: 2.0 ± 0.6 times down-regulated overall mean T2D and OB).

Conclusion: These novel findings demonstrate a direct link between hBRS-3 expression and human diabetes and obesity, which opens for the future the possibility to use this receptor as a molecular target in the treatment of each of these pathologies.

No conflict of interest

D-0986

Liraglutide, a once-daily human GLP-1 analog, improves prediabetes status in obese subjects over 20 weeks: a randomized placebo-controlled trial

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Aims: Prediabetes has an estimated prevalence in the US of more than 20% and predicts the development of type 2 diabetes. Liraglutide reduces HbA_{1c} by 1.0–1.5%, weight by 2–3 kg and systolic blood pressure (SBP) by 2–6 mmHg at doses up to 1.8 mg in patients with type 2 diabetes. This double-blind, placebo-controlled trial with open-label orlistat comparator investigated the effect of liraglutide doses up to 3.0 mg in obese non-diabetic subjects. The primary outcome was body weight. This abstract focuses on secondary outcomes prediabetes status and SBP.

Methods: Subjects (18–65 years, BMI 30–40 kg/m^2), of whom 175 had prediabetes based on 2003 ADA guidelines, were randomized equally to 1 of 4 liraglutide doses (1.2, 1.8, 2.4 or 3.0 mg OD s.c.), placebo OD s.c. or orlistat (120 mg 3x daily orally) for 20 weeks. Prediabetes was defined as IGT or IFG (IGT: 2h glucose 140–199 mg/dL in OGTT; IFG: FPG 110–125 mg/dL). Subjects were advised to reduce daily energy intake by 500 kcal and to increase physical activity. www.clinicaltrials.gov ID: NCT00422058.

Results: In the ITT population (561 of 564 randomized subjects) using LOCF, estimated mean placebo-subtracted weight loss from randomization was 2.1 kg [95% CI 0.6-3.6] (liraglutide 1.2 mg) to 4.4 kg [2.9-6.0] (3.0 mg). Mean weight loss with liraglutide 3.0 mg was 7.2 kg. Total weight loss from screening, including 2-week run-in, ranged from 4.1 ± 3.9 kg (placebo) to 9.1 ± 5.2 kg (liraglutide 3.0 mg, Table). Prediabetes incidence over 20 weeks was reduced by about 90% with liraglutide 1.8–3.0 mg. In a post hoc analysis, liraglutide-treated subjects had significantly greater odds of having normal glucose tolerance at Week 20 compared to placebo or orlistat ($p<0.01$ all doses). The number of subjects needed to be treated to prevent one case of prediabetes was 3–6 with liraglutide 1.2–3.0 mg, compared to 24 with orlistat. Estimated mean placebo-subtracted change in SBP was -1.6 mmHg [-5.6; 2.5] (liraglutide 1.2 mg) to -4.7 mmHg [-8.7; -0.7] (liraglutide 2.4 mg; $p<0.02$).
Compared to placebo, more events of nausea and vomiting of mild to moderate intensity occurred with liraglutide, mostly within the first 4–6 weeks. 11 (3%) liraglutide-treated subjects withdrew due to these events.

Conclusion: Liraglutide 1.2–3.0 mg once daily for 20 weeks produced weight loss, reversed existing prediabetes and reduced SBP in obese subjects. Treatment with liraglutide may have the potential to delay the onset of type 2 diabetes.

	Liraglutide					
	1.2 mg	**1.8 mg**	**2.4 mg**	**3.0 mg**	**Placebo**	**Orlistat**
Change baseline – Week 20						
Body weight from screening (kg)[1]	-6.7 ± 4.0	-7.1 ± 5.8	-7.9 ± 5.0	-9.1 ± 5.2	-4.1 ± 3.9	-5.5 ± 4.3
Prediabetes to normal status	18/26 (69%)	26/27 (96%)	23/26 (88%)	24/25 (96%)	13/28 (46%)	9/22 (41%)
SBP (mmHg)[1]	-6.1 ± 11.1	-4.8 ± 12.7	-9.1 ± 12.3	-6.4 ± 10.0	-3.2 ± 13.3	-4.3 ± 10.9
Estimated OR[2]						
Vs placebo	3.0 [1.1; 8.1]	26.1 [3.8; 181]	10.7 [2.4; 47]	12.5 [2.9; 55]	-	-
Vs orlistat	3.0 [1.1; 8.3]	26.3 [3.7; 185]	10.8 [2.4; 48]	12.6 [2.9; 56]	-	-

[1]Mean ± SD
[2]Estimated mean OR [95% CI] for normal glucose tolerance

Conflict of interest:
Paid lecturing: Arne Astrup: Novo Nordisk, Neuroscience Leo Niskanen: Eli Lilly, Merck, Novo Nordisk, Boehringer Ingelheim, Astra Zeneca, Sanofiaventis, Bristol-Meyers squibb, Pfizer Stephan Rossner: Novo Nordisk
Stock ownership: Leo Niskanen: Novo Nordisk, Mads F Rasmussen: Novo Nordisk, Angela Harper: Novo Nordisk
Advisory board: Arne Astrup: Novo Nordisk, Neuroscience Luc Van Gaal: Novo Nordisk, Aila Rissanen: Novo Nordisk, Nick Finer: Novo Nordisk
Employee: Mads F Rasmussen: Novo Nordisk, Angela Harper: Novo Nordisk, Commercially-sponsored research: Arne Astrup: Novo Nordisk, Neuroscience Aila Rissanen: Novo Nordisk, Leo Niskanen: Novartis, Astra Zeneca, Novo Nordisk, Mazin Al Hakim: Novo Nordisk, Nick Finer: Novo Nordisk, Stephan Rossner: Novo Nordisk, Mike Lean: Novo Nordisk

D-0987

Contribution of the myostatin gene polymorphisms to normal variation in lean mass and fat mass in Chinese male offspring nuclear families

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Objective: Myostatin is a TGF-beta family member that is a negative regulator of skeletal muscle growth. Our previous studies suggested that the genetic polymorphisms in *myostatin* likely play a role in attainment of peak BMD in Chinese women, furthermore, +2278G>A, which is detected by direct sequencing, had significant within-family association with BMI in Chinese female nuclear families using quantitative transmission disequilibrium test (QTDT). However, no study has been performed on the genetic association of *myostatin* gene polymorphisms and related traits variation in Chinese male nuclear families. Our study is aimed to investigate the association of *myostatin* gene polymorphisms and lean mass (LM) and/or fat mass (FM) variation in Chinese men.
Methods: We have recruited 400 male nuclear families from 2004 to 2007, composed of 1215 individuals with at least one male child whose age is between 18- 44 years (mean age 30±6). The studied single nucleotide polymorphisms (SNPs) are tag-SNPs, which are located within the *myostatin* gene were selected from NCBI Gene Bank Databases (http://www.ncbi.nlm.nih.gov/sites/entrez) and International HapMap Project (http://www.hapmap.org/cgi-perl/gbrowse/hapmap3_B36), respectively. We performed to genotype the three tag-SNPs (rs2293284, +2278G>A, rs3791783) in *myostatin* by TaqMan and further tested whether these SNPs were associated with body lean mass and fat mass variation at the arms, legs, trunk, total and BMI in our 400 Chinese male offspring nuclear families using QTDT, respectively. Fat mass and lean mass were measured by dual-energy X-ray absorptiometry (DXA) on a GE-LUNAR prodigy (U.S.A.). Raw body lean mass and fat mass were adjusted by age as covariates.
Results: Using QTDT, we found significant within-family association between fat mass variation and rs3791783 at trunk (p<0.001). Moreover, subsequent permutation 1000 tests were in agreement with the finding (p<0.001). However, the other two SNPs had no significant within-family association with Body lean mass and fat mass at any body site. Moreover, for within-family association, significant associations were found between haplotype AGG, AAA and TGG and the trunk fat mass, respectively (all p<0.001).
Conclusions: These results suggested, for the first time, that genetic polymorphisms in *myostatin* have an effect on normal variation in fat mass in Chinese male, and *myostatin* gene may be a candidate for the genetic determination of body fat mass in Chinese men.

No conflict of interest

D-0988

Prevalence of diabetes in Santhals, a tribal population of Bangladesh and India

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Background and aims: Santhals are considered as the third largest tribe in a combined territory of Bangladesh and India. They are non-Aryan and indigenous population, living in the forests and maintain livelihood by hunting and gathering. Deforestation forced them to change their livelihood to fishing and cultivation. They are at risk for developing obesity and Type 2 diabetes (T2DM), impaired fasting glucose (IFG) observed in other aborigines. There is no published document so far citing health status of Santhals. We address some biophysical characteristics and prevalence of T2DM, IFG, and systolic and diastolic hypertension (sHTN, dHTN).
Subjects and methods: We purposively selected 10 villages in the remote Manda thana under Nougaon district, inhabited by Santhals. We discussed with tribal leaders. They agreed to volunteer. All subjects of age 20y or more were eligible. Investigations included social status, height, weight, waist, hip, blood pressure (SBP, DBP), fasting blood glucose (FBG) and lipids (total cholesterol (chol), Triglycerides (TG)). Body mass index (BMI = wt kg/ht msq.) and waist-to-hip ratio (WHR) were calculated. ADA diagnostic criteria were used for T2DM and IFG. For sHTN and dHTN, the cut off values were >135 and >85mmHg, respectively.
Results: A total of 1047 (m/f = 421/626) subjects volunteered. Their mean (SD) age was 39.2 (14.7)y. The mean (SD) values for BMI, WHR and FBG were 18.9 (2.3), 0.85 (0.06) and 4.7 (0.68) mmol/l, respectively. Their SBP was 127 (22) and DBP was 80 (12) mmHg. For chol and TG, the values were 152 (31) and 99 (40) mg/dl, respectively. The crude prevalence of T2DM was 3.1% (m v. f = 2.5 v. 3.5%) and IFG was 7.9% (m v. f = 8.1 v. 7.7%). T2DM and IFG showed no difference between men and women. They had high prevalence sHTN (24.4%) and dHTN (24.6%). Though men had significantly higher BMI and WHR the women had significantly higher sHTN (16.2 v. 29.9%; p<0.001)) and dHTN (18.3 v. 28.9%; p<0.001).
Conclusions: This study is the first to report the prevalence of diabetes and hypertension in the Santhals. The observed characteristics and the prevalence of diabetes and hypertension will help determining the change or trend in future. It is not clear why there was lower prevalence of diabetes and very high prevalence of hypertension with minimal obesity. Possibly, high salt intake might be cause of hypertension. Their poor earning with strenuous physical labor forced them to take large amount of rice and table salt as they can not afford pulse or vegetables, not mentioning costly fish or meat. More study is needed to confirm this for the prevention of hypertension in the Santhals.

No conflict of interest

D-0989

High-fat and low-fat meals modulated gastric mucosa transcriptome

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The ineffective short-term control of feeding behaviour compromises energy homeostasis regulation and can lead to obesity and its metabolic complications, such as type 2 diabetes. The gastro-intestinal tract secretes several satiating and appetitive peptides. However, except for ghrelin, little is known about the stomach peptides contribution to the acute regulation of energy intake. In the attempt to identify new gastric signals that can acutely influence food intake, we used the serial analysis of gene expression (SAGE) method for the transcription profiling of stomach mucosa in 7 groups of mice: fasting; and sacrificed 30 minutes, 1 hour, 3 hours after a low-fat (LF30m, LF1h, LF3h) or high-fat (HF30m, HF1h, HF3h) *ad libitum* meal. From a total of 56381 SAGE tag species detected, 39 genes have been differentially modulated by LF and HF meals compared to fasting, including 12 mRNAs coding for digestive enzymes and 10 novel transcripts. Although the basic stomach gene profile did not undergo substantial variations, both LF and HF meals influenced the transcription. This study represents the first global analysis of stomach transcriptome as induced by different nutritional stimuli. Further studies including the characterization of novel genes may help to identify new targets for the therapy of obesity.

No conflict of interest

D-0990

Hexosamine biosynthetic pathway regulates adipogenic gene expressions during 3T3-L1 adipocyte differentiation

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Introduction: Obesity is characterized as increasing adipose tissue which results in adipokines secretion and involves in development of metabolic complications. However, regulation of adipocyte differentiation and adipokines secretion still need further clarification. O-linked N acetyl- glucosamine (O-GlcNAc) modification has been implicated in regulation of signaling pathway, cell function and gene expression in several cell types. Hexosamine biosynthetic pathway (HBP) generates the sugar nucleotide UDP-GlcNAc, which is the donor for O-GlcNAc modification of nucleocytoplasmic proteins.
Aim: of this study is to investigate the role of HBP and protein O-GlcNAc modification on the regulation of adipocyte differentiation and related gene expression.
Methods: 3T3-L1 preadipocytes were cultured with induction media containing high glucose (25mM), insulin (0.32mM), dexamethasone (1mM) and isobutylmethylxanthine (0.5mM) for 8 hours, 1, 2, 3, 4, and 6 days. Then, the O-GlcNAc modification proteins were detected by O-GlcNAc Western Blot Detection Kit. Messenger RNAs of SREBP-1, C/EBPs, PPAR-gamma, S3-12, perilipin, adipophilin, adiponectin, visfatin, apelin, retinol-binding protein 4 and angiotensinogen were measured by real-time PCR. The mature adipocytes were identified by Oil-Red Staining. Azaserine (AZA) was used to block the HBP key enzyme GFAT-1.
Results: Our results demonstrate that the O-GlcNAc modified proteins are increased in the process of 3T3-L1 preadipocyte differentiation. SREBP-1, C/EBPs, PPAR-gamma, S3-12, perilipin, adipophilin, adiponectin, visfatin, apelin, retinol-binding protein 4 and angiotensinogen mRNAs are increased in mature adipocytes. However, blocking HBP by AZA prevents the differentiation of 3T3-L1 cells and mRNA overexpression of the above adipogenic genes.
Conclusion: The results suggest that HBP activation and change of protein O-GlcNAc modification maybe a novel pathway mediating adipocyte differentiation and lipid formation.

No conflict of interest

D-0991

3111T/C clock gene polymorphism is associated with metabolic changes in Brazilian obese children and adolescents

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Aims: Dysregulation of intrinsic circadian rhythmicity seems to play a role in the development of obesity and Metabolic Syndrome (MS). Functional 3111T/C single nucleotide polymorphism (SNP) of the (*Circadian locomotor output cycles kaput*) *CLOCK* gene, located in the 3'-UTR, may have a part in the genetic susceptibility to metabolic alterations involved in these pathologies. The aim of the present study was to investigate whether the 3111T/C SNP could be associated with metabolic changes that are seen in states of obesity and MS, in Brazilian obese children and adolescents (OCA).
Methods: Study subjects consisted of 312 OCA (BMI = p95th), 36.8% boys, aged 10.6±1.2 years, 46.4% pubescent, BMI 30.1±0.4 kg/m^2, ZscoreBMI 2.3±0.01, representing the two genotypes for 3111T/C SNP: TC+TT (Tx) group and CC group. The presence of 3111T/C SNP alelles was evaluated by Real Time PCR, using TaqMan primers and probes. Fasting serum levels of glucose, insulin and leptin were measured. HOMA%B and HOMA%S were calculated to evaluate insulin secretion and insulin sensitivity respectively, using calculations obtained from www.ox.ac.uk website. MS was defined using the International Diabetes Foundation (IDF) criteria. Statistical analyses were performed using t test and two types of regression analysis.
Results: Allele frequencies in OCA were 92% of Tx and 8% of CC. Genotype distributions did not deviate from Hardy-Weinberg expectations. Anthropometric measures were not altered between genotypes. Insulin and leptin levels were higher in CC individuals when compared with allele T carriers (insulin: CC- 20.1±2.2 vs Tx- 16.9±0.6 mUI/ml, P<0.05; leptin: CC- 56.8±6.4 vs Tx- 41.4±1.7 ng/ml, P<0.02). HOMA%B was also higher in CC children (CC- 185.8±12.5 vs Tx- 159.3±3.9, P<0.05) and HOMA%S was not changed in groups, although it showed a tendency to be higher in Tx subjects. Correlations of minor allele C with insulin secretion and insulin levels were found after performing multiple linear regression analysis, adjusted to ZIMC and presence of SNP (ß=-0.09, P=0.026 and ß=-0.13, P=0.024, respectively). Using the IDF criteria in OCA, it was observed that 16.7% were classified as having MS. Logistic multinomial regression analysis was performed with MS results adjusted to ZIMC and puberty, and showed that CC subjects have higher risk for MS than Tx carriers (Exp(ß): 2.6; IC 95%: 1.0-6.76; P=0.045).
Conclusions: Although 3111T/C polymorphism is poorly present in Brazilian obese children and adolescents' population, it seems that presence of T allele is more protective to develop insulin resistance and MS. The results suggest that 3111T/C SNP has a relevant association with metabolic changes related to obesity and MS in Brazilian OCA.
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No conflict of interest

D-0992

Depot-specific expression of the transcription factor, T-Box 5, in human adipose tissue

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Aims: Upper body adipose tissue (AT) has been associated with an increased risk of cardiovascular disease and diabetes while lower body AT appears to be "metabolically-protective". At the cellular level, regional AT depots display distinct functional characteristics and vary in terms of their adipogenic and proliferative capacity. Preliminary data using transcriptional profiling of human abdominal and gluteal AT identified T-Box 5 (TBX5), a transcription factor implicated in the regulation of cellular proliferation and differentiation, as a very differentially expressed gene. The aim of this study was to investigate the expression of TBX5 in different regional AT depots, isolated preadipocytes and during adipogenesis.
Methods: Paired abdominal-gluteal subcutaneous AT biopsies were obtained from lean (BMI=23.5±0.3kg/m^2, n=20) and obese (BMI=33.6±1.2kg/m^2, n=20) subjects from the Oxford Biobank. Additionally, preadipocytes were isolated from abdominal (n=9) and gluteal (n=5) AT biopsies from healthy volunteers. Preadipocytes were cultured in adipogenic media for 14 days to induce adipocyte maturation and were harvested during adipogenesis. Total RNA was extracted from biopsies and cells and real-time PCR was performed. Expression values were calculated by the efficiency-corrected Ct model and were normalized to housekeeping genes.
Results: TBX5 expression was higher in abdominal AT (1.00±0.04) than gluteal AT (0.66±0.06; P<0.001). Female subjects (n=20) displayed elevated abdominal (0.97±0.05) and gluteal (0.80±0.08) TBX5 expression compared to male subjects (abdominal, 0.79±0.04; gluteal, 0.36±0.04; n=20, P<0.05) and TBX5 expression was higher in lean females (0.99±0.11, n=10) than obese females (0.60±0.07, n=10; P<0.01). Gluteal TBX5 expression was negatively correlated with BMI (r= -0.48; P<0.05) and waist circumference (r= -0.62; P<0.001). Isolated preadipocytes displayed striking depot-specific differences in TBX5 expression which were retained after 2-3 passages (abdominal, 0.76±0.10; gluteal, 0.06±0.03; P<0.001). The expression of TBX5 was not altered during differentiation and at day 14 similar abdominal-gluteal differences were apparent (abdominal, 0.63±0.08; gluteal 0.05±0.02; P<0.001).
Conclusions: TBX5 displays depot-specific differences in expression in whole human AT and specifically in isolated preadipocytes. This may impact on regional adipocyte biology through the differential regulation of downstream targets. The finding that abdominal-gluteal differences in TBX5 expression were retained during culture supports the view that preadipocytes from different regional depots are inherently distinct.

No conflict of interest

D-0993

Acarbose improves hypoglycemia after gastric bypass surgery by decreasing postprandial exaggerated insulin and glucagon-like peptide 1 response

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Introduction: Postprandial hypoglycemia after Roux-en-Y gastric bypass (RYGB) is a severe complication of this surgery with unknown prevalence. Acarbose, an alpha-glucosidase inhibitor (AGI), is empirically employed in its treatment. Several studies have shown that AGIs increase the postprandial levels of glucagon-like peptide 1 (GLP-1) in normal and diabetic subjects. This fact is very important, because the GLP-1 increase is one of the factors involved in the physiopathology of hyperinsulinemic hypoglycemia.
Objective: Assess the effects of acarbose on glucose, insulin and GLP-1 plasma levels in patients with hypoglycemia post RYGB or dumping syndrome.
Methods: 8 patients were studied fasting and 30, 60, 90, 120 and 180 minutes after the intake of standard liquid meal (STM) (Ensure Plus®; 355 Kcal; 13 g protein; 50 g carbohydrate; 11 g fat). The test was repeated the following week with oral administration of 100 mg of acarbose (Glucobay ®) 15 minutes before the STM. We measured plasma levels of glucose (glucose oxidase), insulin (RIA) and GLP-1 (ELISA). Data are expressed as mean ± standard error of the mean (SEM). Area under the curve (AUC) was calculated by trapezoidal method. The Kolgomorov-Smirnov test was used to assess normality. Parametric and non-parametric paired test were used to compare values. P value < 0.5 was considered significant.
Results: 6 patients had a symptomatic hypoglycemia during the test (glucose level $<$ 55 mg/dl) associated to exaggerated insulin and GLP-1 response. Acarbose ingestion avoided hypoglycemia in 5 patients with a significant increase of glucose levels at 90' and 120' and a significant decrease at 15' and 30'. Acarbose ingestion decreased AUC_{0-180} for serum insulin and GLP-1 levels at 15'.
Conclusions: Acarbose avoided hypoglycemia post RYGB, decreasing the hyperinsulinemic response produced by the carbohydrate intake. This was associated to a decrease in the earlier GLP-1 secretion, in contrast to non operated subjects. This finding could be explained by the reduction of glucose load in the jejunum, the main stimulus for GLP-1 secretion, produced by the alpha-glucosidase inhibition.Therefore, acarbose is a safe option in the treatment of this condition.

Value (mean ± SEM)	Without acarbose	With acarbose
Plasma glucose (mg/dl) at 15'	182.9 ± 7.5	134.0 ± 10.9
Plasma glucose (mg/dl) at 30'	153.3 ± 11.7	121.5 ± 11.5
Plasma glucose (mg/dl) at 90'	52.2 ± 6.9	65.7 ± 3.9
Plasma glucose (mg/dl) at 120'	62.3 ± 3.2	73.2 ± 3.5
AUC_{0-180} for serum insulin (µU per ml per min) (mean ± SD)	13,008 ± 6,612	7,668 ± 4,587
GLP-1 levels (ng/dl) at 15'	647 ± 277	305 ± 62

No conflict of interest

HEALTHCARE AND EPIDEMIOLOGY

Cohort studies

D-0994

Incidence of diabetes in Scottish children 1984 to 2003

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Previous studies of the incidence of diabetes in Scottish children have shown: a rise in incidence from 10 per 100,000 in 1968, to 18 in 1976, to 26 in 1993. The incidence was higher in rural areas, and lower in less affluent urban ones. The aim of this study was to bring the incidence data up to date, and to examine urban/rural and socio-economic variations.
Methods: The SSGCDY maintains a register based on reporting of new cases by paediatricians and physicians. The main method of validation against an independent source is hospital discharge data. Feedback of expected versus reported numbers to paediatricians and physicians also acts as a prompt to completeness. A new urban/rural classification which incorporates both settlement size and remoteness was used. A new composite index of socio-economic status was used.
Results: Incidence has continued to rise, by around 2.6% a year over the period 1984 to 2003. Incidence is higher in remote areas. There is seasonal variation in older age groups. The excess in remote areas appears to be seasonal, applying only in the winter peaks. The average age at onset has dropped by about 7 months. Less variation by socio-economic status was seen than in previous studies.
Conclusion: The incidence of type 1 diabetes in Scottish children aged under 15 reached 35 per 100,000 in 2003, making it one of the highest in the world.

No conflict of interest

D-0995

Improvements of vascular risk factors and quality of care in type 2 diabetes in France during 2001-2007 (for the Entred scientific committee)

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Aims: National cross-sectional studies of people with diabetes were undertaken in France in 2001 and 2007 to describe the health, quality of care, quality of life, educational needs of people with diabetes and the cost of diabetes care.
Methods: In 2007, a random sample of 8926 adults was drawn from the French medical insurance system (covering 75% of the population) among people who were reimbursed from at least 3 deliveries of oral hypoglycaemic agents (OHA) or insulin during the past 12 months. All medical reimbursements and hospital data were extracted for 3 years. Three surveys were undertaken: patient short phone interview and mailed-questionnaire (47% and 48% response rates), and a mailed questionnaire to their medical doctors (62% response rate). Data were weighted for the sample design and characteristics of non-respondents. The 2007 data were compared to the similar 2001 data.
Results: Type 2 diabetes accounted for 92% of all cases. In people with type 2 diabetes, mean age was 66 yrs, mean diabetes duration was 11 yrs, 19% were born abroad, and socioeconomic characteristics were lower than those of the general population in all age-groups. Based on patient reports, obesity was frequent (41%, +7 points since 2001), as well as overweight (39%, -3 points). Based on provider reports, only 15% of people had HbA1c>8% (41%>7%), 49% had blood pressure>130/80mmHg and 18% LDL cholesterol≥1.30g/l. Glycemic control (mean HbA1c 7.1%; -0.3 % since 2001), blood pressure (mean 134/77mmHg; -3/2mmHg) and LDL (mean 1.06g/l; -0.18g/l) control improved over 6 yrs, in all age and sex groups. OHA and antihypertensive treatments were more frequently used: metformin +12 points; combination of OHAs +3 points; combination of insulin and OHA +4 points; statins +24 points; ARBs +17 points; diuretics +12 points. Estimates of diagnosed diabetes complications were somewhat higher in 2007 compared to 2001, which was mostly due to improved screening and treatment: coronary revascularisation +5 points; opthalmologic laser treatment +3 points; frequency of foot risk classification +12 points. Based on reimbursements, an eye fundus exam was performed over a 1 or 2 year time period, respectively, in 52% and 70% of people; and urine albumin in 28% and 44%, respectively. A podiatric exam was performed during the past 12 months in 20% or 66% of people, according to, respectively, patients or doctors. General practitioners provided care for 82% of people without referral to a specialist.
Conclusion: In France, national objectives were to reach the level of 80% of people with diabetes receiving adequate care in 2008: several indicators fall well below this level in 2007. However, many improvements have been monitored over the past 6 years.

No conflict of interest

D-0996

Decreasing stroke rates among Albertans with and without diabetes, 2003-2007

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Aim: Stroke has a major impact on the individual and our health care system. Diabetes is an established risk factor for ischemic stroke and also appears to increase the risk of hemorrhagic stroke. This time-series analysis compared population-based rates of acute ischemic strokes (AIS), transient ischemic attacks (TIA), and hemorrhagic strokes between Alberta residents with and without diabetes.

Methods: Administrative databases from Alberta Health and Wellness were used to identify hospitalizations with a most responsible diagnosis of stroke for all Alberta residents >=20 years old between 2003 and 2007. Alberta is one of ten provincial jurisdictions in Canada with a population of approximately 3.4 million people living in diverse regions. The Canadian National Diabetes Surveillance System algorithm was used to identify people with diabetes. The pathological type of stroke was grouped into three categories: AIS (ICD-9 codes 362.3, 433, 434 & 436 [excluding 433.X0 and 434.X0]; ICD-10 codes H34.1, I63 & I64), TIA (ICD-9 code 435; ICD-10 codes G45, G45.0, G45.1-G45.3, G45.8 & G45.9), and hemorrhagic stroke (ICD-9 codes 430 or 431; ICD-10 codes I60 or I61). Annual age- and sex-standardized rates for each stroke type were compared between Albertans with and without diabetes across the observation period (2003-2007).

Results: The annual age- and sex-standardized rates (per 10,000 people) by type and diabetes status are presented in the following table.

	2003	2004	2005	2006	2007
AIS					
Diabetes	18.3	15.2	15.5	15.9	13.1
No Diabetes	7.1	6.9	6.6	6.4	6.6
TIA					
Diabetes	6.3	6.2	6.5	5.1	5.4
No Diabetes	3.5	3.6	3.4	2.9	2.7
Hemorrhagic Stroke					
Diabetes	3.0	1.9	2.5	2.0	2.0
No Diabetes	1.6	1.4	1.5	1.4	1.4

The age- and sex-standardized rate ratio between diabetes and no diabetes fell from 2.59 in 2003 to 1.99 in 2007 for AIS and from 1.96 in 2003 to 1.39 in 2007 for hemorrhagic stroke. The rate ratio for TIA increased from 1.80 in 2003 to 2.04 in 2007.

Discussion: Stroke rates declined for all Albertans over the observation period of 2003-2007. Within all stroke types, people with diabetes had consistently higher rates compared to those without diabetes. This difference appears to be slowly closing over time for AIS and hemorrhagic stroke; however, it appears to be widening for TIAs.

No conflict of interest

D-0997

Life expectancy following diagnosis of type 2 diabetes

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Introduction: Patients with type 2 diabetes are known to have reduced life span compared to non diabetic population. The cause of death in the majority of the patients with type 2 diabetes is cardiovascular disease. Recommendations from international societies call for tighter control of glycaemia, blood pressure and lipids to reduce mortality and morbidity from diabetes. However recent studies have raised the issue of what should be the "ideal" blood glucose control to reduce the mortality in these patients.

Aims: To compare life expectancy of a cohort of patients with type 2 diabetes in years from diagnosis with that of non diabetic general population of the same age.

Methods: A review of all deaths on the Wirral of patients with type 2 diabetes between 1st January to 31st December 2006 was undertaken. There were total number of 3864 deaths during this time, 1999 men and 1865 women. In order to study the effects of diabetes on life expectancy, we have determined the mean number of years from diagnosis to time of death for all these patients.

We have used this data to construct a survival curve of years of life lived until death from the year of diagnosis of diabetes for males and females. These figures have been subsequently compared with the expectation of life of individuals of the general population of the same age as at the age of diagnosis. These figures were identified in the interim life tables produced by the Office of National Statistics in the United Kingdom.

Results: Study of life expectancy of deceased 3864 type 2 diabetic patients demonstrates a dramatic reduction in life span compared to that of non diabetic population. This is particularly marked in men and in patients diagnosed below the age of 70 years.

Men diagnosed at the age of 50 years have an approximately 12 year reduction in life expectancy; those diagnosed at the age of 70 have a 6 year reduction in life expectancy.

For women there is a 15 year reduction in life expectancy for those diagnosed at the age of 50 and a 6 year reduction in life expectancy if diagnosed at the age of 70.

The difference in women is partly due to an increased expectation of life in women in the non-diabetic population.

Conclusions: It is clear from our study that type 2 diabetes is associated with a very significantly reduced life expectancy. This reduction is particularly marked for men and those diagnosed below the age of 60.

In the population studied it is also found that there has been a downward trend in lipid values and also blood pressure readings during this period but there has been no improvement in glycaemic control.

Despite increased attention to cardiovascular risk factors in diabetes, there is little evidence to date that this is reflected in the prolonged survival in these patients. There remains a large deficit of years lost in both men and women with type 2 diabetes.

No conflict of interest

D-0998

Epidemiology of diabetes mellitus and metabolic syndrome: Beijing scenario

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Aims: To provide the epidemiologic profile of diabetes mellitus and metabolic syndrome in Beijing and to contribute to the prevention and control of these diseases.

Methods: A community-based survey was carried out in Beijing from Sept. to Nov., 2007. Using a stratified cluster random sampling method, 3522 individuals from urban, peri-urban and rural areas were selected as study subjects. Diagnostic criteria for diabetes mellitus and metabolic syndrome were those recommended by WHO and IDF.

Results: The age-standardized prevalence of diabetes was 10.15% (self-reported 5.02% vs undiagnosed 5.13%) and was 10.97%, 11.95% and 6.86% among urban, peri-urban and rural populations respectively ($p<0.01$ when comparing the prevalence of self-reported diabetes among rural area with those among urban or peri-urban areas, while no statistic difference was found when comparing prevalence of undiagnosed diabetes among different areas). The age-standardized prevalence of IGT was 9.84% and was similar among different areas (10.52%, 9.68% and 9.27% among urban, peri-urban and rural areas respectively, $p=0.33$). The age-standardized prevalence of metabolic syndrome was 20.39% and tended to be higher among peri-urban population (20.19%,26.32% and 21.26% among men from urban, peri-urban and rural areas respectively, $p=0.02$; 16.09%, 21.55% and 20.85% among women from different areas respectively, $p=0.06$).

Conclusion: Diabetes and metabolic syndrome are very common in Beijing and probably rising in both incidence and prevalence. Residents in peri-urban and rural areas, with a low rate of awareness, are at equal or even higher risk of developing diabetes and metabolic syndrome when compared with their counterparts living in urban. Our study might underscore the urgency for development of public health strategies which must cover urban, peri-urban and rural communities.

No conflict of interest

D-0999

Baseline characteristics of people with Type 2 diabetes on insulin in Japan compared to the global population: data from the Cardiovascular Risk evaluation in people with Type 2 diabetes mellitus on insulin therapy (CREDIT) study

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Aims: The Cardiovascular Risk evaluation in people with Type 2 diabetes mellitus (T2DM) on insulin therapy (CREDIT) study is evaluating the effect of glycemic control on the risk of cardiovascular events. Here we report the baseline characteristics of Japanese people in the CREDIT study, comparing the results with those of the global population.
Methods: CREDIT is an ongoing, 314-centre, international, non-interventional prospective cohort study, with a 4-year follow-up. Inclusion criteria are as follows: age greater than 40 years, time from diagnosis of T2DM to insulin initiation greater than 1 year, duration of insulin treatment 1-6 months. Study sites were randomly selected from 12 participating countries in North America, Europe and Asia. Baseline data within 1 year before and 1 month after insulin initiation were collected.
Results: There were more patients exhibiting HbA1c>10.0 at baseline in the Japanese population than in the global one (Table). Fewer T2DM people in Japan used basal insulin and the dose was lower than in the global population. A lower percentage of Japanese T2DM people displayed macrovascular disease and renal failure. Reno-cardiovascular risk factors such as hypertension, obesity, and family history of cardiovascular disease were also lower.
Conclusion: The CREDIT baseline data reveal differences between the Japanese and global T2DM population: Japanese people have poorer glycemic control and use basal insulin less frequently and at a lower dose. As the study progresses, it will be of interest to see if adequate regimen changes will lead to better glycemic control in the Japanese population.

Baseline characteristics	Japan (n=511)	Global (n=3031)
Male (%)	63.8	51.0
Body mass index	23.9±4.0	29.3±6.3
HbA1c>10% population (%)	51.6	35.8
Insulin regimen (%) Basal alone	6.3	51.6
Short-acting alone	24.5	7.3
Insulin dose (IU/day) Basal alone	7.2±2.9	14.7±9.4
OADs use (%) Biguanides	29.0	71.2
a-glucosidase inhibitors	34.6	11.9
Macrovascular disease (%)	25.1	34.1
Family history of cardiovascular disease (%)	11.5	25.9
Hypertension (%)	47.6	68.7
Renal failure (%)	15.3	37.9
Concomitant therapy (%) statin	31.9	51.5
ARB, ACEI	35.6	69.0

Footnote: ARB: Angiotensin II type-1 Receptor Blocker, ACEI: Angiotensin Converting Enzyme Inhibitor

Conflict of interest:
Commercially-sponsored research: This study was supported by sanofi-aventis.

D-1000

Effect of glitazones on cancer mortality in type 2 diabetes

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Aims: Numerous studies have observed an association between type 2 diabetes (T2DM) and cancer, with recent reports suggesting a modulating role of antidiabetic therapy. There is little epidemiologic information, however, exploring the effect of the glitazones and cancer mortality in T2DM. We hypothesized a decreased risk of cancer mortality associated with glitazones use, compared to sulfonylurea monotherapy use.
Methods: This was a population-based retrospective cohort study using administrative data from Saskatchewan Health. We identified new users of metformin or sulfonylureas from January 1, 2000 to December 31, 2005, with follow-up until death, departure from the province, or December 31, 2006. We compared cancer mortality between glitazone users (plus metformin), metformin and sulfonylurea combination users, metformin monotherapy users, and sulfonylurea monotherapy users (reference group). A time-varying Cox analysis was used to estimate the hazard ratio (HR) of cancer mortality, accounting for oral antidiabetic therapy, insulin therapy, age, sex, and chronic disease score (CDS). Exposure to oral antidiabetic therapies was defined by use of each agent (i.e., yes/no) within 1-year time windows. We examined the dose-response gradient for insulin exposure. Firstly, we created a count of insulin dispensations for each 1-year time window. Cumulative insulin exposure/year was then calculated by summing insulin counts at the end of each year and dividing by the person years of insulin use since insulin index. We stratified the cumulative insulin exposure level into high, low, and no exposure to insulin.
Results: We identified 20,448 new users of metformin or sulfonylureas during the index period, with an average (SD) follow-up of 3.5 (1.8) years. The mean age for the cohort was 61.3 (14.3) years and 53.8% were men. Unadjusted cancer mortality was 9.8% (154/1,577) for sulfonylurea monotherapy users and 1.3% (43/3,365) for glitazone (plus metformin) users ($p < 0.0001$). After adjusting for age, sex, CDS, and insulin use, glitazone (plus metformin) users had a significantly lower risk of cancer mortality compared with the sulfonylurea monotherapy cohort (HR: 0.42, 95% CI: 0.24 – 0.72; p=0.002). The adjusted HRs (95% CI) for insulin use were 1.33 (0.83 – 2.13) and 7.08 (5.27 – 9.51) for <12 and 12 cumulative insulin dispensations/year, respectively, compared to those using no insulin.
Conclusion: These findings add further support that antidiabetic therapies may play a role in the relationship between type 2 diabetes and cancer outcomes. Our results suggest that patients with type 2 diabetes exposed to glitazones had a significantly decreased risk of cancer mortality compared to patients exposed to sulfonylurea monotherapy. It is uncertain whether this decreased risk is related to a protective effect of glitazones or a toxic effect of sulfonylureas.

No conflict of interest

D-1001

Diabcare Africa 2008: Socio-demographic characteristics of persons with diabetes mellitus in Africa.

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Background: Unlike in the past, it is now accepted that Africa is not exempt from the worldwide epidemic of diabetes mellitus (DM). Country-related socio-demographic characteristics of DM have been reported but no region-wide data are available.
Aim: To describe the socio-demographic features of persons with diabetes in selected countries in sub-Saharan Africa.
Methods: NovoNordisk Diabcare Middle Africa was aimed at collecting basic data about diabetes in six African countries: Cameroun, Ghana, Kenya, Nigeria, Senegal and Tanzania. Each of the centres in the participating countries contributed data they had available for every third diabetic patient obtained by interview, examination of clinical records and HBA_1c measurement at time of data collection. The results of the survey were pooled at the national and continental levels. This communication is a report of the aspects of the pooled

continental data dealing with gender, age, ethnicity, type and duration of DM in the populations studied.

Results: Thirty-one centres in the six countries enrolled 2711 patients. Availability of required information varied from 2533 (93.4%) for age at diagnosis, to 2670 (98.5%) for type of diabetes. About 97% of the patients were Africans while the rest were Arabic (1.9%), Indians (0.5%) or others (0.3%). Region-wide, type 1 and type 2 diabetes respectively accounted for 9.1% and 88.1% of all cases, with T1DM varying from 4.6% to 15.3% among the countries. There was a preponderance of women in all the countries: women 60.9% and men 39.1%. The mean (SD) age of the patients at survey was 53.8 (13.5) years with the mean ages in all the six countries being similar. The mean age at diagnosis of DM was 46.3 (13.6) years with a mean range at diagnosis of 43.5 to 49.2 years. The mean duration of diabetes was 7.5(6.0) across the continent with a wide range of 1-38 years.

Conclusion: There appears to be a preponderance of women with diabetes across Africa. Whether this is artificial or real will need further studies. The duration of diabetes is rather short. The proportion of Type 1 to Type 2 DM appears similar to occurrences in other continents, while age at diagnosis is somewhat lower than reported from elsewhere.

No conflict of interest

LIVING WITH DIABETES

Lifestyle initiatives

D-1002

Community-based weight reduction campaign in Japan, named "3-3 challenge in Kato city"

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Aims: The prevalence of type 2 diabetes is increasing in Japan, so the development of the diabetes prevention program is one of the urgent health issues. Obesity or overweight is known to be one of the major factors for the incidence of diabetes. Thus, the effective weight losing program in the community is strongly needed from a public health perspective. The aim of this study is to evaluate the effectiveness and feasibility of a community-based weight reduction campaign.

Methods: This is a public health campaign held at Kato city with a population of 40,000. General goal of this program was to lose 3kg in 3 months, the title of the campaign "3-3 challenge" was named after this goal. Campaign started in October 2008 and ended in February 2009. During this period, 39 shops in Kato city supported the campaign in various ways. This campaign also included a weight reduction program. A total of 394 community-dwelling people with a body mass index over 23, ranging in age from 20 to 74 years, were registered through public information paper or website of Kato city. In this program, applicants were recommended to weigh themselves twice per day, once in the morning before breakfast and once in the evening after dinner. They were also advised to fill in a daily weight chart and draw the line graph of weight for 3 months. All the participants received leaflets of tips for safe and effective weight loss. In addition, part of the participants who wished (n=140) attended a two-hour group session in October. By the beginning of February, participants reported their final weight in the mail. In March, the public health office of city held a health fair including a briefing session on the result of the program and an award ceremony with the mayor for participants.

Results: Three hundred and eight subjects (male 37%, mean age 52±11 years, mean BMI 26.4±2.8 kg/m^2) completed the program. The dropout rate was 22%. At the end of the program, the mean weight loss from the baseline, was 2.3±2.3kg. A hundred and one subjects (33%) achieved weight loss more than 3 kg. A hundred and fifty three subjects (50%) achieved weight loss more than 3% of the weight. Eighty four subjects (27%) achieved weight loss more than 5% of the weight. In a subgroup analysis, participants with group lesson lost more weight than those without group lesson (2.7±2.4kg vs. 1.9±2.2kg, $p<0.01$). The dropout rate was lower in participants with group lesson than those without group lesson (10 % vs. 28%, $p<0.01$).

Conclusion: These findings suggest that this program is effective and feasible for overweight participants to lose weight in the community setting. This campaign also seemed to foster momentum of health in Kato city. This accomplishment of weight reduction can make some contribution to prevent type 2 diabetes in overweight Japanese.

No conflict of interest

D-1003

BMI may not predict the incidence of diabetes in Asian-Indian subjects: a five year follow-up study from Bangladesh

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Aims: Incidence rates and risk of obesity for type 2 diabetes in lean populations are not well documented. Therefore the purpose of the study was to determine the incidence of type 2 diabetes and to examine the effect of relative changes in obesity (BMI, WHR and waist) measures on diabetes incidence.

Methods: Population based longitudinal study (1999 – 2004) in Bangladesh with clinical, anthropometric and biochemical measurements in 2011 non-diabetic adults aged 20 and above at baseline were followed for five years.

Results: The overall 5 year cumulative incidence of diabetes was 16.4 per 1000 person-years. Those with impaired fasting glucose (5,6 – 6,9 mmol/L) had an incidence rate of 49,2 per 1000 person-years adjusted for age and sex. Significant increase was observed for BMI, waist, WHR, Systolic BP and fasting blood glucose levels. Obesity measures (BMI or WHR) did not show any significant association with the incident cases of diabetes in the adjusted model but waist >85 cm was associated (RR of 2.2 [95% CI 1,3 – 4,0]) in the adjusted model. Relative changes in BMI either by gaining or losing weight by more than 5% from the initial values was significantly associated with the incident cases of diabetes in the age group 41-50 (RR 3.4 [95% CI 1.5 – 7.5]) controlling for age and gender. Other factors of significance were age more than 30 and systolic blood pressure more than 140 mmHg (RR 2,1 [95% CI 1,3 -3,4]) and impaired fasting glucose at base line (>5,5 – 6,0 mmol/L) was strongly associated with the incident cases of diabetes (RR 4,9 [95% CI 3,7 – 6,7]). Risk factors for the relative change in WHR, waist, systolic BP and diastolic BP by gender were all statistically different.

Discussions/conclusions: Incidence of diabetes is increasing at an alarming rate in the rural population of Bangladesh, described as a nutritionally marginalized or lean population. Preventive measures to decrease the incidence of diabetes by reducing body weight in this population, is less likely to make any impact. Further, our data suggest that reducing weight in a lean population (low BMI) may essentially indicate an increased risk for the development of diabetes. Targeted intervention in those with impaired fasting blood glucose will expectedly reduce the incident cases. Dissimilar risk factors by gender and other essential features like waist and blood pressure may be incorporated in the intervention programmes.

No conflict of interest

D-1004

Relationship between overweight children and components of the metabolic syndrome among 6-14 years old Argentinean school children

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Background: Argentina has experienced marked increases in the prevalence of childhood overweight/obesity (OW/OB) over the last few decades; however, there are few data about this problem from school children in this country.

Objectives: We examined 1) the distribution of the mean values of lipids, glucose, and HOMA-IR according to the presence of OW/OB, age, and sex and, 2) the association between metabolic syndrome (MS) and OW/OB, Tanner, gender, and HOMA-IR.

Methods: Data were collected cross-sectionally from 10 elementary schools between April 2006 and March 2008. BMI, waist circumference, blood pressure, fasting lipids, insulin, glucose and Tanner were obtained. Children were divided for analysis in groups according to age (6-9 years and 10-14 years) and gender. Criteria analogous to ATPIII were used for children as IDF definition was proposed only for children over 10 y. MS was defined as the presence of $\geq$3 of the following 5 conditions: (1) abdominal obesity (waist circumference$\geq$90th), (2) triglycerides >110 mg/dL, (3) HDL-C <40 mg/dL, (4) blood pressure $\geq$90th (5) glucose >100 mg/dL.

Results: Over 1009 children (508 m) aged 9.4±2.0y were evaluated. 165 (16.4%) were OB (≥95th percentile), and 166 (16.5%) OW (85-95th). Twenty five (2.5%) were severely OB (BMI≥99th). Most of the children (62%) were pre-pubertal (Tanner 1: 613/979). There was not a significant difference in the prevalence of OW/OB between genders. Differences in BMI and waist circumference increased with age in both genders ($p<0.001$). Mean systolic blood pressure was higher in OW/OB children in both age groups and genders. Triglycerides, insulin, and HOMA-IR were higher ($p<0.001$) and HDL-C lower ($p<0.001$) in OW/OB in both age groups and genders. However mean levels of total cholesterol were only significantly higher among 6-9 year old OW/OB girls. There was not a significant difference in glucose levels between any of the groups. The risk factors of central obesity (279/989; 28.2%) and low HDL-C (199/1009; 19.7%) were common, while hypertension (86/999; 8.6%) and impaired fasting glucose (8/1008; 0.8%) were infrequent. The prevalence of MS was 5.6% overall, 32% in severely OB, 16.4% in OW/OB and 0.4% in normal weight children. The prevalence of one or more component of the MS was 45.8% overall, and was significantly higher in OW/OB (81.8%) than in normal weight (28.3%). The prevalence of two or more components of the MS was 17.8% overall, 44.5% in OW/OB and 4.9% in normal weight ($p<0.001$). None had the 5 components of the MS. Multiple logistic regression showed that BMI (OR 1.39; 95% CI 1.27-1.51), and HOMA-IR (OR 1.88; 95% CI 1.10-3.23) were significantly associated with MS adjusted by gender and Tanner. When Tanner was replaced by age, results did not change.
Conclusions: A substantial number of OW/OB children have the MS. HOMA-IR, and BMI were strong predictors of MS in children suggesting that OW/OB school children are at a higher risk for future metabolic and cardiovascular disease.

No conflict of interest

D-1005

An evidence informed diabetes curriculum to prepare exercise professionals for delivering culturally relevant pre-diabetes physical activity interventions

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Aims: In preparation for a pre-diabetes detection and physical activity (PA) intervention program, we developed a curriculum to prepare fitness professionals to deliver culturally relevant pre-diabetes PA interventions to high-risk target populations. The curriculum is a comprehensive resource on diabetes, pre-diabetes detection, behaviour change methods and culturally relevant PA options to reduce the incidence of type 2 diabetes.
Methods: The curriculum was developed after careful review of scientific literature and clinical recommendations from prominent diabetes associations throughout North America. It is targeted at highly qualified fitness professionals - Certified Exercise Physiologists. The following populations are known to have an elevated risk for type 2 diabetes; South Asian, Aboriginal, African/Caribbean, and East Asian. We identified culturally-relevant PA activities via established contacts within these targeted communities. Special care was taken to quantify the exercise intensity of the culturally-specific activities to calibrate them to known effective PA intervention prescriptions.
Results: The curriculum provides essential diabetes information and highlights the role of lifestyle modification in the prevention/delay of type 2 diabetes. The section on behaviour change provides culturally specific PA recommendations and considerations for pre-diabetes screening, while drawing on methods that integrate key constructs from stages of change, self efficacy and motivational interviewing models. The behaviour change tools were customized with input from the culturally-based community contacts in each high risk sub-group, emphasizing use of appropriate language and awareness of culture-specific barriers and facilitators to PA participation.
Discussion/conclusion: This curriculum provides fitness professionals with the essential information and tools to implement culturally relevant PA based diabetes prevention interventions in high-risk sub-populations to reduce the incidence of type 2 diabetes.

No conflict of interest

D-1006

Providing diabetes care during a military conflict: Learnings and consequences for emergency preparedness

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As a consequence of the military conflict in August 2008 about 130,000 people have been displaced and were accommodated in IDP camps, collective centres and host families. In October about 86,995 IDPs were located in Tbilisi and 46,061 were scattered in different regions. In Gori town there were 6,681 IDPs of which 2,250 resided in tent camps, 2,370 in host families and 2,061 in 28 collective centres (Ministry of Refugees and Accommodation of Georgia). Prevalence of diabetes (DM) and various thyroid pathologies is very high in this population. In those with known DM very high glycemia levels were found; they were caused by a severe stress, and the fact that due to psycho-social and economic conditions patients are unable to adhere to treatment. A large number of fresh cases of type 2/type 1 DM was registered as well; the latter is especially high in children and adolescents. Up to 1,000 persons were consulted/investigated during two actions; fresh cases of DM were revealed in 2% of persons. The operating requirements for caring for those people went beyond the existing resources. Because the flow of refugees occurred without warning, no risk management was possible. In the framework of the emergency management our institute was trying to get support. Using a network of different organisations and personal relationships the provision could be provided. Glucometers and strips could be delivered to all people with DM; they were donated by the international organization "Insulin for Life" and industry. Such actions will be carried out in future and GUDEAS with its partners will actively participate in them.

No conflict of interest

D-1007

Recreational poly-drug use is prevalent amongst people with type 1 diabetes and may be associated with poor glycaemic control – preliminary results from an Australia-wide survey

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Designer drugs have gained increasing popularity during 'rave' parties. Based on the National Drug Strategy Home Survey, 38% of the Australian population over 14 years had used illicit drugs at least once in their lifetime[1]. The prevalence of illicit drug use amongst people with type 1 diabetes is poorly documented. Despite case-reports of life-threatening diabetic ketoacidosis (DKA) complicating drug use in people with type 1 diabetes[2], little is known regarding effects of designer drugs on people with type 1 diabetes[3,4].
Aim: To determine the prevalence, pattern and impact of recreational drug use amongst people with type 1 diabetes in Australia.
Methods: Through radio broadcast and online/hospital advertising, people with type 1 diabetes in Australia were invited to participate in an online survey regarding drug use. Ten questions encompassing demographic details and pattern of drug use were posted.
Results: Of 204 (F=129, mean age: 31±2 years) respondents, 77% had used recreational drugs at least once in their lifetime and 56% had used drugs within the last month. Two-thirds of users were poly-drug users (>3 drugs within last year) and one in five drug-users reported daily drug use. The six most common drugs used were cannabis (87%), "Ecstasy" (62%), "Speed" (53%), cocaine (40%), "Ice" (16%) and ketamine (10%). Nine respondents reported DKA following illicit drug use. Drug-users (N=157, F=71) were similar in age to non-users (30±2 vs 33±3 years old, p=NS) but were significantly more likely to smoke tobacco (33% vs 8%, $p<0.01$). Ninety-four per cent of non-drug users knew their last HbA1c compared to 85 % of drug users ($p<0.05$). HbA1c tended to be higher amongst drug users than non-users (8.1±2.1 vs 7.4±1.1%, p=0.07). Two-thirds of drug users had informed their partners about their drug use, while only 10% had informed their family doctors &/or diabetologists. Fifteen per cent of drug users had told no one about their drug use.
Conclusions: More than 1/2 of the people with type 1 diabetes in our survey had used recreational drugs in the last month, with 2/3 using >3 drugs in the past year. Only one in ten people had informed their health professionals about

their drug use. Recreational drug use may be associated with worse glycaemic control & higher risk of DKA. Health care professionals should be aware of this under-recognised health issue amongst their patients with type 1 diabetes.

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No conflict of interest

D-1008

The influence of weight perception on weight management and dietary behaviors in overweight and obese people with diabetes

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Objectives: Extensive evidence exists on the risks associated with excess weight and chronic diseases, which should provide motivation for weight management in people with diabetes. Studies have also suggested that weight perceptions influence weight management behaviors and may affect efforts aimed at effective weight control in the diabetic population. Hence, this study's objective is to understand how misperceived weight status influences weight control and dietary behaviors in overweight/obese people with diabetes.
Methods: The study population comprised people with diabetes who are overweight/obese and 16 years or older. Three waves of NHANES data from 2001-2006 were used. Self-reported data and biometric measurements of 1,586 participants were obtained. The outcome variables are; an attempt to lose weight, intentional weight loss, physical activity level, and dietary fiber intake. The explanatory variables include demographic factors, family history, and misperception of weight, defined as discordance between study participant's body mass index and self-reported weight status.
Results: Misperceived weight status was more prevalent in overweight participants (77%) compared to obese participants (23%) especially among overweight males (62%) compared to overweight females (38%). Using multivariate logistic regression, we found males had over three times the odds of misperceiving their weight (OR 3.6, CI 2.2-6.0) compared with overweight females. In addition, being overweight (OR 14.4, 8.6-23.8), being a widow, having low education level, and having income $75,000 and above were significantly associated with misperceived weight ($P<0.05$). Overweight participants who misperceived their weight were less likely to attempt to lose weight (OR 0.31 CI 0.14-0.64). While misperception of weight was not associated with dietary fiber intake, the results show racial, gender and income differences in dietary fiber intake. Females were more likely to have higher dietary fiber intake compared to males, Blacks were more likely to have higher dietary fiber intake compared to Whites. Low family income (<$20,000) was a significant indicator of low dietary fiber intake.
Conclusion: The study shows that misperception of weight negatively influences the motivation to lose weight especially in males and overweight people with diabetes. Targeted weight management interventions that focus on modifying weight perceptions may be necessary to achieve effective weight control behaviors in overweight people with diabetes.

No conflict of interest

D-1009

Insight into people living with type 2 diabetes: a global survey of patients and physicians

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Aims: To survey people living with type 2 diabetes and physicians from 8 countries (North America, Europe and Asia) on issues related to the disease and its management.
Methods: 1200 randomly selected patients with type 2 diabetes (35 years and over) and 360 physicians (endocrinologists and diabetologists) were surveyed during three weeks using face-to-face interviews or via telephone. The interviews lasted 20-25 minutes for patients and 15-20 minutes for physicians. One standardized questionnaire used for all interviews addressed the following issues: misconceptions, awareness about diabetes, impact of diabetes on daily life and diabetes treatment.
Results: 68% of patienst had been living with diabetes for over 5 years and 42% for over 10 years. Physicians estimated that an average of 75% of their patients had type 2 diabetes. The majority of patients (72%) of patients believed that earlier diagnosis and treatment may have slowed down their disease progression.46% of patients believed that they were living with symptoms for at least 6 months before being diagnosed with the disease. The majority of patients checked their blood glucose at least once a week (55%). Only 40 % of the youngest (under 45) checked their blood glucose levels at least once a week compared to 67% of the oldest group (75 and over). Checking blood glucose levels at least once a day was recommended by the majority of pysicians. A high percentage of physicians (60%) and patients (63%) underestimated the global prevalence of diabetes. Only 28% of patients agreed that diabetes is as severe a disease as HIV and breast cancer. Less than half of physicians believed that diabetes is responsible for a similar loss of lives each year as HIV (45%) and breast cancer (35%). Many physicians (82%) believed that diabetes has a significant impact on their patients' daily lives. 97% of physicians agreed that diabetes affected their patients' dietary choices without any good metabolic control (39%). Weight gain and hypoglycemia were the main obstacles for treatment for both patients and physicians; Other concerns were disease progression (84%), complications (82%) and inadequate blood glucose control (72%). Diabetes was felt as seriously altering the quality of life, mostly for the younger patients (under 45). Some differences were found between countries.
Conclusions: Type 2 diabetes has a great negative impact on lives of patients in different parts of the world. Its daily management is a real burden. Medication, dietary habits, weight gain, hypoglycemia and long term complications were the main concerns. However, the worldwide magnitude of diabetes and its impact on health were underestimated both by patients and physicians in this survey.

Conflict of interest:
Paid lecturing: JM Ekoé
Advisory board: JM Ekoé
Employee: I. Iliopoulos, N.Nasseri, M.Drolet all from Merck Frosst Canada
Commercially-sponsored research: Merck Frosst

D-1010

Social and economic consequences to women because of diabetes in self or in family in Bangladesh

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Background & aims: People living with chronic diseases like diabetes are especially facing an increasing demand for long-term continuous health care services, leading to increased burden of health care expenses specially among women. BIRDEM data showed that total no of registered diabetic women was 8639 in 2005. Among those 43.9% was from rural, 48.9% was from urban and 5.9% from sub-urban area. 44677 patients were supported by the Social welfare dept and getting medicine and treatment free of cost. Among them female constituted about 62.3%, Juvenile constituted 7.7%. Literacy rate among those women were very negligible. They belong to a very poor socio-economic class. Family earning was less than US $ 42.85. Most of the women were housewife and dependent. The present study was undertaken to observe social and economic consequences to women because of diabetes in self or family in Bangladesh.
Methods: The survey was conducted on 100 women, 25 women who have diabetes and 25 women from diabetic family (either husband or any other member of the family have diabetes) from a tertiary hospital, 25 women who have diabetes and 25 women from diabetic family from sub-urban area.
Results: Twenty three percent believes that it's a communicable disease, 78% can read & write their name, 3% don't go for health care due to lack of awareness and misbelieves, 7% don't get access to the care due to religious restrictions, 74% are from identified poor socioeconomic group, 87% are housewife and dependent, 67% is suffering from financial crisis due to productivity loss, 56% are facing changed behavior of husband and mental stress, 51% reported that dependency on elder son (who is earning) & relatives are increasing, 72% children are depriving either from education or

family emotional attachment, 12% remain unmarried due to diabetes, 9% got divorced due to diabetes herself. Sometimes an unmarried girl is not taken as a wife simply because she has diabetes. When one of the members of the family becomes disabled due to diabetes the whole burden has to be borne by the woman herself. Outpatients cost for diabetes care is the cost per patient was found to be 0.50 US$ for medical care, 7.94 US$ for investigations, 0.76 US$ for health education and nutrition, 0.18 US$ for supporting/overhead services. If complications develop during the onset of disease then it substantially increases the cost of complication as well as care. Uncontrolled foot ulcer and uncontrolled blood glucose costs on an average of US$ 443.60 per patient & US$ 138.08 per patient individually.

Conclusion: Diabetes in women affects the productivity and due to loss of productivity she has to be a burden financially. Bangladeshi diabetic women suffer from a great deal of social, psychological and economic burden which need to be addressed by special attention.

No conflict of interest

D-1011

"Going Back to School": giving at-risk families new HOPE

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New Zealand is a multi-cultural society with 14.1% Maori, and 6.2% Pacific Islanders. Obesity, diabetes, and heart disease are rife, especially amongst these groups, and Type 2 Diabetes is forecast to rise 130-150%, (1996–2011). Language and cultural differences for Maori and Pacific people mean that often they do not access relevant health information delivered through conventional channels. Facilitating lifestyle-change specifically for Maori and Pacific people is a challenge requiring additional skills.

HOPE – "Healthy Options = Positive Eating" was designed by an NGO in Auckland and is delivered to both Maori and Pacific students and parents/caregivers in at-risk areas.

The program has two elements that set it apart:

- increased traction because parents and children receive similar information at the same time;
- a unique combination of physical activity, practice in cooking traditional foods in a healthier way and experiential learning being continually interwoven across the course's multiple sessions.

Aim: The Aim of this program is to encourage families to learn "together" so as to adapt to and adopt enduring healthier lifestyles.

Method: Students participate in a school health-awareness program fostering healthy living. The HOPE initiative then provides the same information for associated parents/caregivers, delivered in a manner appropriate to their understanding. Children are welcomed at the parent program, thus enabling families to learn together. The Presenter of this program is of the same ethnicity as those attending.

The social marketing strategy employed has been devised to encourage creation of a suitable environment to facilitate lifestyle-change based on shared trust and understanding. Behaviour-change is maximised by integrating clear understanding, appropriate changes in attitudes and development of attendees' practical commitment to employ new approaches to nutrition and physical activity.

The HOPE course consists of five sessions during which the family progressively integrates learning into daily life. On completion a one-month is issued to embed the new learning. Then a graduation celebration is held providing opportunity to share the positive experiences gained. HOPE empowers and thereby creates action to reduce obesity, heart disease and diabetes.

Outcome: Three HOPE courses were delivered in 2008, with the initial pilot being subject to careful independent evaluation. HOPE is proving to be a very effective vehicle to stimulate sustained behaviour-change across whole families and filtering on through their community networks.

Conflict of interest:
Employee: Authors are employees of Diabetes NZ Auckland Inc

POSTER PRESENTATIONS

MONDAY 19 - TUESDAY 20 OCTOBER

Access to drugs and technologies

P-1012

Private drug coverage is not associated with better attainment of glycaemic targets in a Canadian glycaemic treatment optimization program

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Aim: To compare glycemic control in patients with private drug insurance and unencumbered access to any oral hypoglycemic agents (OHA) with that in patients who only have access to OHAs approved by their provincial formulary reimbursement program.
Methods: Patients with type 2 diabetes mellitus (T2DM) and glycated haemoglobin (A1C) levels above the 2003 Canadian Diabetes Association guidelines-recommended target of 6.0-7.0% were enrolled in a glycemic treatment optimization program (Time 2 Do More) between March 2006 and September 2007 from the offices of 331 primary care practitioners across 9 Canadian provinces. Four clinic visits aimed at tightening glycemic control were scheduled over 12 months.
Results: Of the 5280 subjects (mean age 60.6±11.9 years), 73% had some form of private coverage while 27% only had public coverage - a ratio mandated by the study design. Subjects with access to private insurance were younger (mean age 58.9±11.6 years vs 65.9±11.3 years for private vs public only; P<0.001). Target A1C≤7.0% attainment increased with consecutive visits (0%, 37.7%, 44.0% and 48.5% for private; 0%, 39.3%, 43.0% and 46.7% for public) but A1C≤7.0% achievement ratios were indiscernible between the groups. The median 12-month A1C for the private and public only coverage groups were 7.1% (IQR, 6.6%-7.8%) and 7.1% (IQR, 6.6%-7.9%) respectively. At visit 4, 48.5% of those with private coverage and 46.7% of those with public insurance achieved the A1C≤7.0% goal (P=0.36). Comparisons of the last measured A1C data (last observation carried forward; LOCF) against baseline A1C show that 73.1% of the subjects with decreased A1C levels vs. 68.6% of those with increased A1C levels had private coverage (P<0.005). Although fasting plasma glucose (FPG) improved with consecutive visits, <50% of all subjects attained the recommended ≤7.0 mmol/L goal after 12 months of treatment (18.5%, 35.9%, 39.9% and 43.4% for private; 19.8%, 34.8%, 38.6% and 39.8% for public).
Conclusions: While A1C decreases were linked with greater private coverage, overall A1C changes were indistinguishable between the two groups. Our results suggest that in Canada, differential insurance coverage did not appreciably influence short term glycemic target attainment in this prospective epidemiologic evaluation of patients with T2DM. Further analyses are required to explain these findings. Given that >50% of these patients still demonstrate an A1C above target, other causes for this care gap must be sought.

Conflict of interest:
Paid lecturing: Altana (Drouin), Astra-Zeneca (Drouin, Leiter), Biovail (Drouin), Bristol Myers Squibb (Drouin, Goodman, Woo, Leiter), Boehringer-Ingelheim (Drouin), Eli Lilly (Goodman, Woo, Leiter), Glaxo Smith Kline (Drouin, Goodman, Ur, Woo, Leiter), Hoffman La Roche (Leiter), Merck Frosst (Drouin, Ur, Woo, Leiter), Novartis (Drouin, Ur, Woo, Leiter), Novo Nordisk (Ur, Woo, Leiter), Pfizer (Drouin, Ur), Sanofi-Aventis (Drouin, Goodman, Harris, Ur, Leiter), Servier (Drouin, Leiter), Solvay Pharmaceuticals (Drouin) and Unilever (Drouin)
Advisory board: Altana (Drouin), Astra-Zeneca (Drouin, Goodman, Langer, Woo, Leiter), Biovail (Drouin), Bristol Myers Squibb (Drouin, Goodman, Woo, Leiter), Boehringer-Ingelheim (Drouin), Eli Lilly (Woo, Leiter), Glaxo Smith Kline (Drouin, Goodman, Langer, Woo, Leiter), Hoffman La Roche (Leiter), Merck Frosst (Drouin, Goodman, Langer, Woo, Leiter), Novartis (Drouin, Leiter), Novo Nordisk (Woo, Leiter), Pfizer (Drouin, Langer), Sanofi-Aventis (Drouin, Goodman, Harris, Langer, Leiter), Schering (Goodman), Servier (Drouin, Leiter), Solvay Pharmaceuticals (Drouin) and Unilever (Drouin)
Commercially-sponsored research: Astra-Zeneca (Goodman, Langer, Leiter), Bayer (Goodman), Bristol Myers Squibb (Goodman, Leiter), Eli Lilly (Leiter), Glaxo Smith Kline (Goodman, Langer, Ur, Leiter), Hoffman La Roche (Goodman, Leiter), Johnson & Johnson (Goodman), Eli Lilly (Goodman), Merck Frosst (Goodman, Langer, Leiter), Norvartis (Leiter), Novo Nordisk (Ur, Leiter), Pfizer (Goodman, Langer), Sanofi-Aventis (Goodman, Langer, Ur, Leiter), Schering (Goodman) and Servier (Leiter)

P-1013

Fibrocalculous pancreatic diabetes - a case presentation

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Objective: To highlight the clinical features of Fibrocalculous pancreatic diabetes and the problems associated with diabetes management in a resource challenged environment.
An 18 year old farmhand was admitted with 3 months history of polyuria, polydipsia and weight loss. He has had history of recurrent abdominal pains.
He is a secondary school dropout, the second of his mother's three children in a polygamous family with 18 children. Father is a farmer.
Examination revealed a young man who was small for age, wasted, dehydrated, with fluffy hair and pale. Weight: 39Kg, Height: 1.5M, BMI: 16.4Kg/m^2, waist circumference: 66cm. The rectum was filled with normal coloured stool containing partially digested rice and beans grains.
The Random blood glucose at presentation was unrecordably high with ketonuria of 3+. He was subsequently managed as a case of diabetic ketoacidosis.
Abdominal X-ray revealed pancreatic calcifications while serum proteins showed hypoalbuminaemia.
He had great difficulty in procuring medications while in hospital. He was counseled on diabetes, hypoglycaemia, foot care and the need for compliance with medications. He was discharged on the 11th day but was subsequently lost to follow-up.
Conclusion: Fibrocalculous pancreatic diabetes is still being seen in Nigeria where its treatment, as it obtains for the treatment of other forms of diabetes, is burdensome economically to the individual.
Keywords: secondary diabetes, access to drugs and technologies.

No conflict of interest

P-1014

Accessing insight: visual impairment and diabetes technologies

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Jennifer Jesso will facilitate discussion and hands-on demonstrations about experiences using diabetes technologies with a visual impairment.
Participants will:
- learn about visual impairments and their effect on vision,
- understand how impaired vision affects the use of diabetes technologies,
- gain insight into how people with visual impairments use diabetes technologies,
- learn easy-to-implement suggestions on educating people with visual impairments in the use of diabetes technologies,
- hear Jennifer's personal experiences with diabetes technologies, and
- hear (and identify!) suggestions for improvements in product design and accessibility.

Jennifer is a professional in the field of visual impairments who has had type 1 diabetes for 18 years and has been legally blind since birth, and manages her diabetes with an insulin pump.

No conflict of interest

P-1015

Type 1 diabetes in "have" children in India: experience and future of the insulin pump therapy program in the state of Karnataka, India - successes, failures and social engineering

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India is a 'continent' of striking extremes and contrasts: ancient to ultra modern, very rich to abjectly poor, highly intelligent to totally illiterate etc, and thus socially justified health care projects must reach out to all sections of society. Our Insulin Pump Project (IPP) was started in 2002; 1st Certified Insulin Pump Project in India; 8 Certified Pump Trainers – CPTs; 3 of them themselves having T1DM and were the initial pump users (1 doctor, 1 diabetes educator, 1 volunteer – computer engineer); primary credit for the continued success of our IPP goes to this volunteer T1DM – CPT (he initiates and troubleshoots pump and runs FREE 24 x7 x 365 helpline); because of the commitment, talent and compassion of this one volunteer serving our group, despite 20 eminent endocrinologists and hundreds of physician diabetologists in our state, 90% of the total pump prescriptions in our state come from our own practice of 2 endocrinologists.
Program: Patients initiated = 36 (T1DM 30, T2DM 5, 2 DM 1); Offered Pump in Clinic = 30; Pump sought by patients = 6; Drop outs = 4 + 1. Reasons for going on pump: Recurrent severe hypoglycemia = 8; Wide fluctuations in BG levels = 20; Suboptimal DM control = 17; Micro / Macro vascular complications = 4; Compromised life style =18; Young children, infants and neonates = 3; Eating disorders = 0; Pronounced dawn phenomenon = 6; Needle phobia = 1; Pregnancy - preconception = 1; Ketosis prone = 1; Competitive athletes = 0. Age at DM diagnosis= 3 to 28 years; duration of diabetes = 0 to 32 years; age at pump initiation= 3 to 45 years; number of years on pump= 1 to 7; number of basal rates per day=4 average; number of boluses per day=4 average. Complications – problems on pump: Severe hypoglycemia = 0; Metabolic deterioration DKA= 0; Site infection / recurrent = 4; Site irritation / scarring = 6; Site failure / cannula occlusion= 6; Body image problem= 2; Insulin omission= 2; Diabetes burnout= 1.
Conclusions: Insulin pump therapy is being increasingly accepted in India - a heterogeneous developing country. Indications, difficulties and limitations are similar to those experienced in more affluent societies. Increased awareness and education of physicians and patients necessary for wider usage and benefits. Technology improvements and cost reduction (refurbished pumps, lower cost disposables) will facilitate.
Man, machine and money: all important.

No conflict of interest

CLINICAL RESEARCH

Alternative medicine

P-1016

Anti-diabetic effect of aqueous extract of Tapinanthus butungii in male sprague-dawley rats

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Background and aim: The prevalence of diabetes mellitus has risen exponentially in the last decade and an increasing number of people are using herbal supplements. Despite significant achievements in treatment modalities and preventive measures, the prevalence of diabetes and its complications have risen astronomically in the last decade. There is therefore a continued need for new and more effective therapies. Our aim was to evaluate the anti-diabetic effects of aqueous extract of fresh green leaves of Tapinanthus butungii in the rat.
Materials and methods: Young adult, male Sprague-Dawley rats weighing 180-200 g were used. Diabetes mellitus was induced in the group of diabetic test rats by intraperitoneal injections of alloxan (150 mg/kg). Hyperglycemic state was induced by administration of subcutaneous injections of 50% Dextrose in water (4 g/kg). Single doses of aqueous leaf extract of Tapinanthus butungii (200, 300 or 400 mg/kg p.o.) were administered to normoglycemic, hyperglycemic and diabetic rats. The hypoglycemic, anti-hyperglycemic and anti-diabetic effects of these single doses were compared with those of glibenclamide (10 mg/kg), chlorpropamide (250 mg/kg), insulin lente (0.1 I.U./kg) and distilled water (2 ml/kg). Blood glucose levels were estimated before treatment, 0h, 1h, 2h, 4h, 8h, 10h and 12h after administration of extract
Results: Aqueous leaf extract of Tapinanthus butungii produced significant dose-dependent reductions ($p < 0.05$-0.001) in the blood glucose concentrations of normoglycemic, hyperglycemic and diabetic rats comparable to glibenclamide, chlorpropamide and insulin lente.
Conclusion: These results suggest that the leaf extract of Tapinanthus butungii has strong and remarkable anti-glycemic property, and is therefore a potential anti-diabetic drug.

No conflict of interest

P-1017

Medicinal plants used to treat diabetes in the south-western regions of Bangladesh

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Diabetes mellitus (DM), particularly type 2 DM is a disease that affects a considerable segment of the population worldwide. The disease is characterized by abnormal insulin secretion with concomitant hyperglycemia and alterations in carbohydrate and lipid metabolism. The disease is also prevalent in Bangladesh, where the vast majority of the rural population relies on medicinal plants administered by traditional medicinal practitioners (Kavirajes) for control of this disease. As the available allopathic medicines are not able to cure DM (they merely control hyperglycemia and secondary syndromes of DM), it is always interesting to find out novel sources of treatment for any potential curative effect. The aim of this study was to conduct an ethnomedicinal survey amongst the Kavirajes of the south-western districts of Bangladesh, which fall under Khulna division, to learn more about plants used to treat DM. It is to be noted that because of the long tradition of alternative medicine in Bangladesh, the Kavirajes possess considerable expertise on medicinal plants, which knowledge is passed from generation to generation. Interviews were conducted with the help of a semi-structured questionnaire and plant species as pointed out by the Kavirajes were pressed on the field, brought and identified at the Bangladesh National Herbarium, where voucher specimens were also deposited. It was observed that 17 plant species were used to treat DM. These plant species (with family names given in parentheses) included Carica papaya (Caricaceae), Coccinia grandis (Cucurbitaceae), Trichosanthes kirilowii (Cucurbitaceae), Cassia occidentalis (Fabaceae), Ficus hispida (Moraceae), Psidium guajava (Myrtaceae), Syzygium cumini (Myrtaceae), Phragmites australis (Poaceae), Coix lacryma-jobi (Poaceae), Heritiera fomes (Sterculiaceae), Cinnamomum tamala (Lauraceae), Mirabilis jalapa (Nyctaginaceae), Scoparia dulcis (Scrophulariaceae), Murraya koenigii (Rutaceae), Glycosmis pentaphylla (Rutaceae), Morinda citrifolia (Rubiaceae), and Drynaria quercifolia (Polypodiaceae). Scientific studies on extracts of whole plants or plant parts have already established the hypoglycemic potential of Trichosanthes kirilowii, Psidium guajava, Coix lacryma-jobi, Scoparia dulcis, Murraya koenigii, and Syzygium cumini. It is expected that more scientific studies will be able to find out novel pharmacological constituents in the above-mentioned plant species, which can prove to be of considerable importance in treating DM.

No conflict of interest

P-1018

Preclinical and clinical trials of a new phytotherapeutic drug (Semelil - ANGIPARS™) for wound healing in diabetic foot ulcer

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Aim: Most of the treatments proposed for the diabetic foot have a partial effect in ulcer improvement and amputation rate; so more effective treatments are essential. The aim of the present study was to show safety and efficacy of Semelil (ANGIPARS™) as a new phytotherapeutic candidate for wound healing.

Methods: In experimental studies acute toxicity, genotoxicity (Comet assay), sub-acute Toxicity, mutagenic properties (Ames test, dominant lethal mutation in germ cells, chromosomal aberration, embryo toxic & teratogenic properties and allergic effects were evaluated. Then in clinical studies The Maximum Tolerated Dose (MTD) and Possible Dose Limiting Toxicities (DLTs) were determined. Then randomized controlled clinical trials for efficacy of intravenous, oral and topical routes of this herbal extract in diabetic foot ulcers were done.

Results: According to preclinical studies, Semelil had no severe acute or chronic toxicity and it was recommended for clinical trials. No toxicity or major side effects were observed up to daily dose of 10ml of this drug. Semelil by intravenous route is more effective than standard therapy without any side effects ($p<0.05$). This herbal extract by oral (Improvement ratio (%) 87.847 ± 10.95) and combination of oral and topical route (Mean improvement ratio (%) 84.380 ± 3.521) is more effective ($p<0.05$) than standard therapy (Mean improvement ratio (%) 25.092 ± 14.54) without any side effects.

Conclusion: The absence of any significant side effect indicates that ANGIPARS™ could well become a part of routine therapy for diabetic foot ulcers. However, further studies with greater sample size are necessary.

No conflict of interest

P-1019

Herbal drug for the management of diabetic complications

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Aim: To study the pharmacological potential of anti- diabetic compound (FIIc) purified from fruit-pulp of Eugenia jambolana (EJ) in diabetic rats.

Methods: Chromatographic purification of aqueous extract of EJ yielded pharmacological active compound FIIc. Homogeneity of FIIc was confirmed by HPLC. Effect of FIIc was studied against diabetes induced macro vascular and micro vascular complications.

Results: FIIc resulted significant fall ($p< 0.001$) in FBG and Glycosylated Hb (51.5%) in SD after 15 day Tt. Plasma insulin levels were significantly increased ($p< 0.001$). In vitro studies showed 3 fold increase in insulin levels. FIIc significantly improve the altered metabolism by increasing ($p< 0.001$) the activity of key enzymes of glycolysis and decreasing ($p< 0.001$) the glyconeogenesis. After Tt, liver and muscle glycogen content increased by 55 & 51 % respectively. FIIc showed its significant anti thrombotic effect by significantly improving the levels of VCAM-1 and fibrinogen along with NO levels. Oxidative stress parameters were significantly improved after Tt with FIIc. Atherogenesis indices were also significantly normalized. FIIc significantly improved ($p< 0.001$) the kidney function tests (blood urea, creatinine, microalbuminurea). Renal hypertrophy, which was observed in diabetic rats, decreased significantly along with improvement in histomorphological changes.

Conclusion: FIIc has potent antihyperglycemic and antihyperlipidemic activity. It is pancreatic as well as extrapancreatic in action. It has attenuated the early stages of diabetes induced macro and micro vascular complications.

No conflict of interest

P-1020

Synergistic effect of ferulic acid on glucose uptake activity in L6 myotubes

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Diabetes mellitus is a chronic disorder characterized by increased blood glucose level and the cause is insufficient or inefficient insulin response. There are 20.8 million children and adults in the United States who have diabetes and it cause about 5% of all deaths globally each year. Ferulic acid a phenolics physiochemical present in the plant cell wall providing rigidity. In animal and in vitro studies suggests that ferulic acid may have direct antitumor activity against breast cancer and liver cancer. We have used the nonradioisotope, enzymatic method for 2DG uptake assay. This paper understands the effect and the mechanism of action of ferulic acid in L6 myotubes. The study reveals that ferulic acid has enhancing effect on glucose uptake in a time- and dose-dependent manner. The 4 hour incubation with 25 µM ferulic acid shows approx 2.97- fold increase in glucose uptake. Ferulic acid has a synergistic effect in combination with metformin or THZ with a maximum 2DG uptake increased by 4.98- and 5.11- fold of the base value (without the drugs or the natural products) respectively. At molecular level, elevated levels of the expression of GLUT4 (2.78-fold) and PI3K (2.07-fold) genes were observed with ferulic acid. The studies indicate that chlorogenic acid enhances glucose uptake by increasing GLUT4 expression via PI3K dependent pathway, which is in line with glucose uptake. The effect of ferulic acid on the ATP: AMP and ATP: ADP ratio also been studied. Collectively, our findings suggest that the phytochemicals can replace the commercial drugs in part, which could lead to a reduction in toxicity and side effects of the commercial oral drugs.

No conflict of interest

P-1021

Prevalence and traditional management of diabetes mellitus in the Guinean urban and rural areas

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Aims: To determine the prevalence of diabetes mellitus in urban and rural areas in Guinea. To evaluate the use of traditional medicine in the treatment of diabetes.

Methods: A transversal study was conducted through 510 inhabitants of both urban and rural areas. An ethnobotanical investigation was carried out by the Research and Valorisation Centre of Medicinal Plants of Dubreka (Guinea) on the basis of validated questionnaires.

Results and discussion: The prevalence of diabetes mellitus was quiet higher in the urban area of Siguiri (13,70% ; 34/248) than that of the rural area in Kankan (5,72% ; 15/262). Through an ethnobotanical investigation, 67 traditional healers (8 women and 59 men) were contacted and 28 of indigenous plant species were collected. From these, 23 were botanically determined. The most cited ones being Combretum micranthum G. Don, Xylopia aethiopica (Dunal) A. Rich, Piliostigma thonningii (Schum.) Milne-Redhead. Among these, "Fadakada" a mixture recipe of two plants was selected and submitted to an ethnotherapeutical evaluation in 31 patients. The oral administration of the recipe during 7 days led to a significant decrease (42.29 mg/dl; $p<0.0002$) of the glycemy; any significant side effects were recorded and the clinical signs were improved.

Conclusion: These preliminaries results well supported the traditional antidiabetic use of "Fadakada". Biological; phytochemical and clinical investigations are in progress.

No conflict of interest

P-1022

Role of faradism for diabetic foot pain syndrome - a clinical evaluation

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Background and objectives: Faradic current has been used in medical science since the period of early development in electro-analgesia. Foot burning and pain syndromes are common feature of diabetic neuropathy among uncontrolled diabetic patients. Peripheral micro-circulatory problem causes peripheral neuropathy that forms into foot burning sensation and pain. Intermittent faradism (faradic current therapy) causes peripheral vasodilatation, increased muscular pumping activity and enhances soothing effect on nerve endings and hypoalgesia. Aim of our study is to find out the clinical efficacy of faradism for diabetic foot pain syndrome sufferers.
Methods: An experimental clinical study was done among 20 foot burning sufferers. Mean age 55.8 years (SD=11.79), sex ratio, M: F= 7:13. Patients were primarily selected (excluded foot ulcer) and referred to the physiotherapy department by the medical officer. Then they were assessed and explained about the study protocol. After considering ethical issues and inform consent the patients were assessed with the questionnaire sheet. All patients were treated by intermittent faradism for 10 minutes per session for 20 days. Intermittent mode selected as 5-second pulse with 2-second rest. Footbath technique applied for both feet, separately in different plastic bowl as single pole method of each foot immersed under water. Intensity was selected as maximum as individual patient can tolerate. After successfully completed 20 session of treatment they were re-assessed by the questionnaire sheet. Then both data were collected for statistical analysis. Basically we had used the Numeric rating Scale (NRS) of pain; also we had calculated 'pain hours/day' and 'pain days/week' to quantify pain.
Results: Mean state of pain hours per day was; before treatment=18.50 (SD=7.53) and after treatment=9.10 (SD=7.43). Mean state of pain days per week was; before treatment=7.00 (SD=0.00) and after treatment=6.86 (SD=0.54). Mean pain score in NRS was; before treatment=5.37 (SD=1.38) and after treatment=3.16 (SD=1.26).
Conclusions: Faradism applied as foot bath technique is effective for diabetic foot pain syndrome in our small scale, limited study. We need some good quality of RCT type double blind or placebo controlled trial study in a large scale subjects to realize the actual efficacy of faradism in diabetic foot pain syndrome.

No conflict of interest

P-1023

Anti-diabetic effect of Korean traditional Baechu (Chinese cabbage) kimchi in a type 2 diabetes model of rats

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Aims: The present study was investigated to study the anti-diabetic effects of Korean traditional Baechu (Chinese cabbage) kimchi in a type 2 diabetes model of rats.
Methods: Five-week-old male SD rats were fed a HF-diet for 2 weeks then divided into 4 groups namely: Normal Control (NC), Diabetic Control (DBC), Kimchi Low (KML, 0.5%), and Kimchi High (KMH, 2.0%) groups. Diabetes was induced by an injection (i.p.) of STZ (40 mg/kg BW) in all groups except the NC group.
Results: After 4 weeks feeding of experimental diets, serum insulin concentrations and pancreatic beta cell functions were increased and HbA1c level was decreased in the kimchi fed groups compared to the DBC group, when significant ($P < 0.05$) difference was observed only in the KMH group for serum insulin concentration. Although lower fasting blood glucose and better glucose tolerance were observed in the KMH group compared to the DBC and KML groups, differences were not significant. Blood glycated hemoglobin (HbA1c), serum lipid profile and liver glycogen were not influenced by kimchi-containing diets.
Conclusion: Data of this study suggest that dietary Baechu kimchi has some anti-diabetic effects even when fed with a HF-containing diet.

No conflict of interest

P-1024

Medicinal plants used by alternative medicinal practitioners of Rajshahi district, Bangladesh to treat diabetes and secondary infections

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Diabetes mellitus (DM) and secondary infections arising out from DM are common afflictions affecting millions of people in today's world. The disease is characterized by abnormal insulin secretion and consequent hyperglycemia. Allopathic medicine does not provide a complete cure for the disease. On the other hand, alternative medicinal practitioners in many countries of the world treat this ailment with formulations prepared from plants and these formulations are often claimed to completely cure DM. There is, therefore, at present a world-wide interest in medicinal plants for treatment of DM. In Bangladesh, alternative medicinal practitioners of various districts treat DM with medicinal plants. The formulations and use of plants vary from district to district. The objective of this present study was to conduct an ethnomedicinal survey amongst the alternative medicinal practitioners of Rajshahi district, Bangladesh to collect information on medicinal plants and formulations used to treat DM. Interviews were conducted with the help of a semi-structured questionnaire and plant specimens as pointed out were collected and identified at the Bangladesh National Herbarium. 17 plant species were found to be used to treat DM, while 1 plant species was used to treat secondary infections arising out from DM. The 17 plant species (with family name given in parenthesis) included Mangifera indica (Anacardiaceae), Vinca rosea (Apocynaceae), Cocos nucifera (Arecaceae), Wedelia chinensis (Asteraceae), Coccinia cordifolia (Cucurbitaceae), Caesalpinia bonduc (Fabaceae), Cassia occidentalis (Fabaceae), Tamarindus indica (Fabaceae), Lagerstroemia speciosa (Lythraceae), Punica granatum (Lythraceae), Azadirachta indica (Meliaceae), Stephania japonica (Menispermaceae), Ficus racemosa (Moraceae), Zea mays (Poaceae), Murraya koenigii (Rutaceae), Abroma augusta (Sterculiaceae), and Clerodendrum viscosum (Verbenaceae). The seeds of Swietenia mahagoni (Meliaceae) were administered with the bark of Anthocephalus chinensis (Rubiaceae) and leaves of Cyperus rotundus (Cyperaceae) by the alternative medicinal practitioners to treat secondary infections arising from DM. The above-mentioned plants hold good potential for the treatment of DM since a perusal of the scientific literature showed hypoglycemic activity to be present in extracts of plant parts of a number of the above-mentioned plant species.

No conflict of interest

P-1025

Effect of supervised yoga exercise on glycaemic control in diabetes mellitus

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Aims:
To evaluate the effect of defined yoga exercises in diabetes on glycemic control, blood pressure, lipid profile, BMI, and requirement of oral hypoglycaemic agents and/or Insulin.
Methods: 77 consecutive diabetes mellitus subjects on standard diabetes management were randomly allocated to a yoga group (41 subjects) and a control group (36 subjects).
41 patients in the study group were performing supervised yoga exercise protocol while the controls were not on this supervised protocol.

1. Health rejuvenating exercises (5min)
2. Body posture (asanas)
   a. Surya namaskar/ parmeshwar vandana (3min)
   b. Paschimottanasana (3min)
   c. Ardhamatsyasana (3min)
   d. Uttanadsana (3 min)
   e. Sarwangasana (3min)
   f. Matsyasana (3min)
3. Abdomen exercise (7min)

4. On every alternate day either
    a. Relaxation exercises (Kayotsarga) (30 min) or
    b. Preksha meditation including prayanama and Anupreksha (30min) along with relaxation exercises.

These patients were asked to come for yoga exercises for at least 5 times a week for 3 months duration and were compared with 36 controlled group patients who received standard diabetic therapy without yoga.

Results: Glycemic control in the control group improved, the HbA1c decreasing from 9.16±0.82 to 8.22±1.13, and Fasting blood sugar (FBS) declined from 190.39±29.43 to 172.21±27.13 mg%. In the yoga group these improved,with HbA1c 9.35±1.02 to 8.58±0.97 and FBS from 183.9±39.26± to 150.66±34.21 mg%. The initial values between the 2 groups were not significantly different but the final values in the 2 groups were statistically significantly different ($p<0.05$ for HbA1c and < 0.001 for FBS).

Thus the yoga group showed significant improvement in the mean post treatment levels of HbA1c and FBS both in comparison to the mean pre treatment values as well as in comparison to post treatment control values suggesting a highly beneficial effect of yoga in diabetic management.

Conclusion: Supervised Yoga improves glycaemic control in diabetes and is therefore advisable.

No conflict of interest

P-1026

Post marketing surveillance of ANGIPARS

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Aim: One of the most important complications of diabetes is foot ulcers with a life time risk of 15% among diabetics. With the growing prevalence of diabetes worldwide, its related complications bound to increase, which not only results in major economic consequences for the patients but have a significant burden on public health which highlights the necessity for prevention and timely treatment of diabetic foot ulcers. The main objectives of this study was to evaluate the effect of oral and intravenous application of ANGIPARS, a novel compound applied in treatment of diabetic foot ulcers, on ankle brachial Index (ABI) and toe pressure and wound temperature in diabetic foot ulcers.

Methods: A total of 75 diabetic patients aged between 18-75 with foot ulcer who had no signs of wound infection were enrolled in this study. A basal toe pressure, ABI and wound temperature was measured and routine hematological and biochemistry tests plus erythrocyte sedimentation rate (ESR) and serum creatinine were performed. Six and 12 weeks after simultaneous application of oral and topical forms of ANGIPARS, mentioned parameters were evaluated again and analysis was carried out using standard methods.

Results: The mean age of the participants was 56.77 ± 9.7. The mean surface area of the ulcers were 6.05± 11 cm^2 at the baseline and 1.17 ± 3.5cm^2 after3 month of therapy showing a considerable decrease. A significant rise in ABI ($p<0.05$) was observed after 6 weeks of therapy. No significant changes were observed in toe pressure or wound temperature after 3 months. The results also showed a significant fall in ESR and serum calcium levels. No significant side effects or toxicity was reported by the participants during the course of the study.

Conclusion: This study showed the immense effect and safety of ANGIPARS on treatment of diabetic foot ulcers.

No conflict of interest

P-1027

Alternative medicine use and self-care habits in diabetes mellitus

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Aims: Self-care in patients with diabetes mellitus includes self home glucose monitoring (SHGM), drug compliance and use of complementary and alternative therapies (CAM). This study aims to document self-care practices in people with DM.

Methods: This was a cross-sectional questionnaire survey involving 262 patients with DM attending a tertiary care centre in Lagos, Nigeria. Biodata, duration of DM, usage of home glucose monitors and blood pressure monitors, adherence to medications and CAM usage were documented.

Results: There were 165 (63%) females and 97 (37%) males with a total mean age (SD) of 60 (10.7) years. CAM users made up 122 (47%) of the study population. CAM users were significantly older than non-CAM users (61.6 (9) vs 58.3 (11), p= 0.006). The herbal products used included bitter leaf (vernonia amygdalina), aloe vera, garlic, ginger, and native herbs. Optimal blood glucose and blood pressure control were comparable in CAM and non-CAM users. SHGM, drug compliance, insulin usage, educational status and duration of DM were also comparable in both groups.

Discussion/conclusion: CAM utilization is an important facet of self care in our patients with DM that needs to be studied.

No conflict of interest

P-1028

Medicinal plants used to treat diabetes in Bogra and Pabna districts of Bangladesh

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Bangladesh is a small country but with a population of more than 150 million. The rural population as well as a segment of the urban population relies on traditional medicinal practitioners (Kavirajes) as their primary health-care providers. It has been estimated that as high as 3.8% of the rural population and a greater percentage of the urban population suffers from diabetes mellitus (DM). They are administered to by the Kavirajes, who depend on various formulations of medicinal plants as treatments. Since DM cannot be cured by modern allopathic medicine, it was of interest to survey the medicinal plants used by the Kavirajes as remedy for this ailment. The objective of the present study was to conduct an ethnomedicinal survey amongst the Kavirajes of two central districts of Bangladesh to know more about the medicinal plants in usage to treat DM. Surveys were conducted through personal interviews and with the help of a semi-structured questionnaire. All plant specimens as pointed out were pressed, dried and brought to the Bangladesh National Herbarium for complete identification and where voucher specimens were also deposited. A total of 22 plant species were obtained from the Kavirajes used in the treatment of DM. These plant species (with family names given in parentheses) included Cassia occidentalis (Fabaceae), Coccinia cordifolia (Cucurbitaceae), Ageratum conyzoides (Asteraceae), Alpinia nigra (Zingiberaceae), Aegle marmelos (Rutaceae), Morinda citrifolia (Rubiaceae), Abroma augusta (Sterculiaceae), Ficus hispida (Moraceae), Pongamia pinnata (Fabaceae), Caesalpinia bonduc (Fabaceae), Phyllanthus emblica (Euphorbiaceae), Azadirachta indica (Meliaceae), Andrographis paniculata (Acanthaceae), Phyllanthus niruri (Euphorbiaceae), Cinnamomum tamala (Lauraceae), Cotula hemisphaerica (Asteraceae), Anthocephalus chinensis (Rubiaceae), Cassia angustifolia (Fabaceae), Syzygium cumini (Myrtaceae), Momordica charantia (Cucurbitaceae), Alstonia scholaris (Apocynaceae), and Ficus benghalensis (Moraceae). Of the plants obtained in the present survey, modern scientific studies have established the hypoglycemic potential of whole plant or plant parts of Coccinia cordifolia, Aegle marmelos, Morinda citrifolia, Pongamia pinnata, Phyllanthus emblica, Azadirachta indica, Andrographis paniculata, Phyllanthus niruri, Syzygium cumini, Momordica charantia, and Ficus benghalensis. Since allopathic medicine has no cure for DM, it is of interest to conduct studies on the anti-diabetic plants found in the present survey for their potential in preventing or curing DM.

No conflict of interest

P-1029

Medicinal plants used by alternative medicinal practitioners of Nilphamari, Chuadanga and Magura districts, Bangladesh to treat diabetes mellitus

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Diabetes mellitus (DM) is a disease which affects a sizeable segment of the population of Bangladesh. Alternative medicinal practitioners (AMPs) form the primary health-care providers in Bangladesh. They use a variety of medicinal plants to treat DM, which can vary considerable between AMPs of different districts. The objective of this present study was to conduct an ethnomedicinal survey amongst the AMPs of Nilphamari, Chuadanga and Magura districts, Bangladesh to collect information on medicinal plants used to treat DM. The

importance of this type of survey lies in the fact that allopathic medicine has no known cure for DM. As a consequence, there is renewed interest in medicinal plants for isolation of compounds, which can prove effective in treating DM. Interviews were conducted of the AMPs and plant specimens as pointed out be them were collected and identified at the Bangladesh National Herbarium. The names of 20 plant species were collected, which are used by AMPs of these three districts to treat DM. These plant species (with family name given in parenthesis) included Cocos nucifera (Arecaceae), Phoenix sylvestris (Arecaceae), Tecoma gaudichaudi (Bignoniaceae), Carica papaya (Caricaceae), Coccinia cordifolia (Cucurbitaceae), Momordica charantia (Cucurbitaceae), Phyllanthus niruri (Euphorbiaceae), Cajanus cajan (Fabaceae), Cassia occidentalis (Fabaceae), Lagerstroemia speciosa (Lythraceae), Ficus racemosa (Moraceae), Psidium guajava (Myrtaceae), Syzygium cumini (Myrtaceae), Averrhoa carambola (Oxalidaceae), Aegle marmelos (Rutaceae), Citrus grandis (Rutaceae), Capsicum annum (Solanaceae), Abroma augusta (Sterculiaceae), Clerodendrum viscosum (Verbenaceae), and Curcuma longa (Zingiberaceae). A number of these plants are also used by AMPs of other regions of Bangladesh suggesting that the plants could be potentially important for isolation of lead compounds for treatment of DM.

No conflict of interest

P-1030

Medicinal plants used by the Garo tribe, Bangladesh to treat diabetes mellitus

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The Garo tribe inhabits the north-central districts of Tangail, Netrakona and Mymensingh districts of Bangladesh. They have their own traditional medicinal practitioners, who use medicinal plants for treatment of their various ailments. Diabetes mellitus (DM) is prevalent amongst the rural and urban population of Bangladesh including tribal people, and this ailment cannot be cured by modern allopathic medicine. The objective of the present study was to conduct an ethnomedicinal survey among the Garo tribal medicinal practitioners to find out about plant species used for treatment of DM. Interviews were conducted of the Garo practitioners with the help of an interpreter, and plant species as pointed out by the practitioners were collected and identified at the Bangladesh National Herbarium. It was observed that a total of 17 plant species were used by Garo practitioners to treat DM. These plant species (with family name given in parenthesis) included Cassia occidentalis (Fabaceae), Tamarindus indica (Fabaceae), Cinnamomum tamala (Lauraceae), Cajanus cajan (Fabaceae), Clerodendrum viscosum (Verbenaceae), Punica granatum (Lythraceae), Abroma augusta (Malvaceae), Syzium cumini (Myrtaceae), Psidium guajava (Myrtaceae), Ficus racemosa (Moraceae), Moringa oleifera (Moringaceae), Manihot esculenta (Euphorbiaceae), Tinospora cordifolia (Menispermaceae), Ocimum sanctum (Lamiaceae), Nymphaea nouchali (Nymphaeaceae), Solanum torvum (Solanaceae), and Achyranthes aspera (Amaranthaceae). It was also observed in the present survey that a high degree of patient satisfaction exists among those receiving medicinal plant treatment for DM. It is also to be noted that a number of the above-mentioned plant species like Tamarindus indica and Syzygium cumini have been reported in scientific studies to possess considerable hypoglycemic potential. The other plant species need to be studied scientifically for their potential to treat DM.

No conflict of interest

P-1031

Hypoglycemic effect of aqueous extract of Trichosanthes dioica in normal and diabetic rats

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Background: Trichosanthes dioica is used to treat diabetes mellitus, epilepsy, alopecia, and skin disease in folklore medicine. The extract of leaves of the plant is used in diabetes mellitus but there is no scientific studies reported.
Aims: To study the effect of Trichosanthes dioica on serum glucose level in glucose loaded, normal and hyperglycemic rats.
Settings: Kasturba Medical College, Manipal, Karnataka State, India.
Design:Experimental
Methods and Materials: The aqueous extract of leaves of Trichosanthes dioica were compared with glibenclamide for their influence on fasting blood sugar in glucose loaded, normoglycemic and streptozotocin induced (45mg/kg ip) hyperglycemic rats.
Statistical analysis: The data was analyzed by one way ANOVA followed by Scheffe's post hoc test.
Results: In glucose loaded rats, normal rats and hyperglycemic rats the aqueous extract at both the doses (800mg/kg/p.o and 1600mg/kg/p.o) reduced blood glucose significantly when compared to control but it was not as effective as glibenclamide.
Conclusion: The aqueous extract of Trichosanthes dioica with its beneficial effects on blood sugar could serve as good adjuvant to other oral hypoglycemic agents.

No conflict of interest

P-1032

A randomized placebo controlled trial of herbal medicine (Sugaradik) in the treatment of type 2 diabetes

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Aim: This study was undertaken to evaluate the safety and effectiveness of polyherbal powder (Sugaradik) in achieving glycemic control in newly diagnosed type 2 diabetics.
Methods: Study design: A randomized double blind placebo controlled study. Eighty newly diagnosed patients of type 2 diabetes were selected after meeting inclusion and exclusion criteria. Patients were randomly divided into two groups. One group received drug and other group received placebo bearing a distinctive code number. Anthropometric parameters and HbA_1c were performed initially as well as after 3 months of treatment period. Fasting blood sugar and blood pressure were recorded weekly.
Results: After 3 months of treatment with polyherbal powder (Sugaradik) there was a significant improvement in BMI (24.48±0.64 to 25.44±0.62), systolic blood pressure (136.05±3.30 to 126.42±1.51 mmHg) and fasting blood sugar (233.03±8.81 to 136.16±4.96 mmHg; $p<0.001$). There was a significant reduction in HbA_1c (8.39±0.30 to 6.37±0.10; $p<0.001$). No adverse effects were observed in this trial.
Conclusion: Polyherbal preparation of 10 classic herbs appears to be effective in controlling glycemia. Sugaradik seems to be a safe drug and an effective oral agent in the management of type 2 diabetes.
Statistical methods: Student's 'T' test.

No conflict of interest

P-1033

A biochemical investigation of Tulbaghia Violacea's anticoagulant and antidiabetic properties

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Secondary metabolites derived from plants, especially those used by traditional healers, are in the forefront of new drug development to combat diseases such as cancer and diabetes. Garlic is employed in indigenous medicine all over the world for the treatment of a variety of diseases. Dietary garlic has been recognized for its beneficial health effects. In particular, garlic consumption has been correlated with (i) reduction of risk factors for cardiovascular diseases and cancer, (ii) stimulation of immune function, (iii) enhanced detoxification of foreign compounds (iv) hepatoprotection, (v) antimicrobial effect and (vi) antioxidant effect, and most importantly its hypoglycemic and anticoagulant properties. Due to these beneficial properties, garlic and its closely related genera (which includes Tulbaghia Violacea), may be useful as coadjuvant therapy in the treatment of type 2 diabetes and some of its physiological complications. The aim of this study is to determine the anticoagulant and antidiabetic properties of Tulbaghia Violacea. Extraction procedures for both protein and sulfur organic compounds have been performed on the roots, leaves, bulbs, seed and flowers. Platelets were also exposed to the extracts to determine their effects upon platelet aggregation, adhesion and protein secretion. Of the above mentioned extracts, the organic bulb extract has shown

the highest potential at inhibiting platelet aggregation and adhesion. Similarly this extract was able to improve glucose-stimulated insulin secretion in SNI-1 pancreatic ß- cells.

No conflict of interest

Blood lipids and lipoproteins

P-1034

Prevalence and predictors of nonalchoholic fatty liver disease in type 2 diabetic patients

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Non-alcoholic fatty liver disease (NAFLD) is common in patients with type 2 diabetes and its clinical diagnosis is based on ultrasonography. The aim of this study was to determine the prevalence of fatty liver and its predictive factor in type 2 diabetes patients reffered to Ahvaz university diabese clinic.
Material and methods: The study was performed on 272 consecutive nonalcohol and hepatitis B and C virus-negative type 2 diabetes patients, attending Ahvaz university diabetes clinic. All of them underwent a complete clinical and biochemical work up, including demographic and anthropometric factors, lipid profiles, fasting plasma glucose, glycated hemoglobin (HbA1c), liver transaminases and alkaline phosphatase. Liver ultrasonography was done for each patient.
Results: Patients' average age was 51±10 years. Sixty-eight percent of patients were female. 189 patients (70%) ultrasonographically diagnosed as NAFLD. Average body mass index (BMI) was higher in NAFLD patients than normal group (28.7±4.6 kg/m2 vs. 25.0±3.8 kg/m2, P=0.00). Among age, gender, duration of diabetes, glylated hemoglobin,serum level of triglyceride, total cholesterol, creatinine, liver enzymes and body mass index (BMI), the best predictor of NAFLD in type 2 diabetic patients was BMI [odds ratio=1.26, 95% CI: 1.16 to 1.37] and serum triglyceride level was the next predicting factor after BMI [odds ratio=1.46, 95% CI: 1.01 to 2.11].
Conclusion: The findings of this study demonstrate that the nonalchoholic fatty liver has high prevalence in type 2 diabetes patients, and BMI and serum triglyceride can be considered as two independent predictors of NAFLD in these patients.

No conflict of interest

P-1035

Association between lipid profile and coronary artery disease in type 2 diabetic patients

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Various risk factors act synergistically for the development of macrovascular complications, such coronary artery disease (CAD), in type 2 diabetes mellitus (T2DM) patients. The contributions of risk factors have yet to be clearly identified and quantified, but diabetic dyslipidaemia has specific importance.
Aim: To investigate the association of dislipidaemia with CAD in a T2DM population.
Methods: Cross sectional study in 874 patients with T2DM who visited Montes de Barbanza public health center, a specialized secondary referral center, which provides services to the 31 urban district of Madrid (Pueblo de Vallecas), Spain between April and September 2007 for a routine follow-up. In addition to routine tests, total cholesterol (TCh), HDL-cholesterol (HDL-Ch), and triglycerides (TG) were measured and LDL-cholesterol (LDL-Ch) was calculated (Friedewald) in all of the subjects after an overnight fast. The selected patients were evaluated for presence of CAD using standard techniques. Estimated values of TCh> 240 mg/dl; TG> 150 mg/dl, HDL-Ch< 40 mg/dl and LDL-Ch> 130 mg/dl were considered as abnormal. Multiple regression analysis was done to evaluate the association of CAD with abnormal lipid profile. A level of P<0.05 was considered statistically significant (SPSS, v. 13.0).
Results: The mean age of the study group was 65.6 ± 12.6 years with average duration of diabetes 13.0 ± 10.2; 44% were male and 17% (166 patients) had previous CAD. Data regarding lipid profile showed that out of 166 patients with CAD, TCh >240 mg/dl was seen in 13% of patients, LDL-Ch> 130 mg/dl in 13,1%, HDL< 40 mg/dl in 27,9%, and TG> 150 mg/dl in 17,6%. Regression analysis revealed an association of high TCh (P=0.015) and LDL-Ch (P=0.033), and low HDL-Ch (P=0.001) with CAD.
Conclusions: The present study has shown that the most common lipid abnormality in T2DM patients with CAD of the population studied was low HDL-Ch. Moreover the study showed a strong correlation of low HDL-Ch with CAD. Hence, appropriate preventive and new treatment strategies to increase the HDL-Ch should be considered timely in T2DM patients with CAD.

No conflict of interest

P-1036

A study of serum lipoprotein (a) and diabetic nephropathy in Chinese hospitalized type 2 diabetic patients

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Aims: To examine the relationship of serum lipoprotein (a) [Lp (a)] and diabetic nephropathy in Chinese hospitalized type 2 diabetes patients.
Methods: A total of 1238 (725 men and 513 women;aged 58.1±13.9 years) hospitalized type 2 diabetic patients were selected based on inclusion criteria. Normoalbuminuria (n=929), microalbuminuria (n=229) and macroalbuminuria (n=80) were defined as urinary albumin excretion rate (UAER) of <30mg/24h, 30mg-300mg/24h and >300mg/24h, respectively. Lipid profile, blood glucose, serum creatinine and hemoglobin A1c (HbA1c) were measured. Glomerular filtration rate (GFR) was estimated by the simplified MDRD equation.
Results: (1) There was no significant difference of serum Lp (a) level among different age groups. (2) Lp (a) of macroalbuminuria group was significantly higher than that of normoalbuminuria and microalbuminuria group (p<0.05). However, no significant difference was observed between patients with normoalbuminuria and microalbuminuria. (3) For quartiles of Lp (a), UAER and GFR showed significant association with Lp (a) (p<0.05). (4) Lp (a) positively correlated with total cholesterol (TC), low density lipoprotein cholesterol (LDL-C) and UAER (r=0.152, 0.169, 0.18, p<0.01) and negatively correlated with GFR (r=-0.061, p<0.01). Significant association with Lp (a) and UAER was shown after adjusting for GFR. (5) Multiple stepwise regression showed systolic pressure, Lp (a), LDL-C, GFR and age were independent risk factors for UAER.
Conclusions: Lp (a) level was associated with the progression of diabetic nephropathy regardless of age, diabetes duration and glycemic control.

No conflict of interest

P-1037

Gender-based comparisons of dyslipidemia in urban Indian diabetes patients, with and without metabolic syndrome

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Aim: Dyslipidemia is associated with metabolic syndrome (MS) and diabetes mellitus (DM). The Asian Indian population has a high prevalence of MS and type 2 DM. Data is lacking on the characteristics of dyslipidemia in this population. We studied gender-based differences in various parameters between type 2 DM patients with and without MS.
Methods: In all, 21292 patient records were prospectively analyzed from our clinics in Mumbai. Selected patients were over 20 years of age, had complete records for analysis and did not have type 1 DM or primary dyslipidemia. Patients being treated for hypertension or dyslipidemia were also included. MS was defined using the National Cholesterol Education Program Adult Treatment Panel III criteria. Based on this, a total of 4963 patient records were included. Of these, 3817 patients had DM and MS (1936 males; 1881 females), while 1146 patients had DM but no MS (880 males; 266 females). The Student's t-test was used to compare groups. P<0.05 was taken as significant.

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Results:

Table 1: Prevalence of MS components

	DM with MS		DM without MS	
	Males	Females	Males	Females
Number	1936	1881	880	266
SBP≥130 mmHg or DBP≥85 mmHg	1764	1461	392	64
Waist circumference >108 cm (males), >90 cm (females)	700	1505	44	64
Triglycerides >150 mg/dl	1486	1217	196	12
High-density lipoprotein <40 mg/dl (males), <50 mg/dl (females)	1174	1340	72	48
Fasting blood sugar >110 mg/dl	1627	1737	776	214

MS, metabolic syndrome; DM, diabetes mellitus; SBP, systolic blood pressure; DBP, diastolic blood pressure

Table 2: Male-female comparisons

	DM with MS			DM without MS		
	Males*	Females*	P value	Males*	Females*	P value
Number	1936	1881		880	266	
Age (years)	54.17 ± 10.32	54.8 ± 10.1	0.06	51.38 ± 13.24	50.38 ± 14.84	0.29
DM duration (months)	103.77 ± 92.49	98.37 ± 96.67	0.08	102.63 ± 92.82	115.52 ± 112.81	0.6
Triglycerides†	211.62 ± 119.36	185.55 ± 90.57	<10-6	135.03 ± 65.83	104.94 ± 31.03	<10-6
HDL†	40.07 ± 10.67	45.53 ± 11.4		49.2 ± 15.55	56.28 ± 11.57	
HDL<TARGET† (males <40, females <50)	-0.07 ± 10.67	4.47 ± 11.4	<10-6	-9.2 ± 15.55	-6.28 ± 11.57	0.005
Fasting blood sugar†	170.23 ± 63.76	188.58 ± 69.33	<10-6	163.3 ± 57.58	176.34 ± 73.85	0.003
Post-prandial blood sugar†	240.95 ± 94.76	252.97 ± 95.93	10-4	228.44 ± 91.37	254.41 ± 106.28	10-4
Waist circumference (cm)	99.08 ± 10.57	96.72 ± 10.87	<10-6	92.63 ± 8.51	84.8 ± 14.09	<10-6
Mean arterial pressure (mmHg)	99.94 ± 9.12	99.47 ± 9.72	0.12	93.12 ± 8.12	90.09 ± 8.47	<10-6

DM, diabetes mellitus; MS, metabolic syndrome; HDL, high-density lipoprotein
** Mean ± standard deviation*
† Units: mg/dl

Conclusion: In the DM with MS group, men had higher triglycerides, HDL and waist circumference; and better glycaemic control compared to women. There was no gender difference in mean arterial pressure (MAP). In the DM without MS group, men had higher triglycerides, HDL, MAP and waist circumference; and better glycaemic control compared to women.

No conflict of interest

P-1038

Levels of lipoprotein (a) in the adult population of the municipality of Maracaibo, Venezuela

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Introduction and objectives: Lipoprotein (a) [Lp (a)] is an independent risk factor for cardiovascular disease. The aim of this study was to determine the levels of Lp (a) in the adult population of Maracaibo Municipality and its relationship to personal and family pathological history.
Materials and methods: A descriptive, transversal study was held on 1335 individuals on which complete clinical history was performed and determined glycaemia, insulin, lipid profile and Lp (a). The normal distribution of the variables was corroborated by the Geary test, and the results expressed as mean ±standard deviation, given as reference values for our population those found between the percentiles 10 and 90.
Results: the population mean of the Lp (a) levels was 27.67 ±14.52 mg/dL (upper limit 28.67 mg/dL; lower limit 26.67 mg/dL, 99% confidence interval) [male (28.14 ±14.79mg/dL) and female (27.10 ±14.19 mg/dL)], with no significant difference (p>0.05). Most of the population, presented concentrations of Lp (a) in a range of 10.70 mg/dL (percentile 10) and 47.39 mg/dL (percentile 90). Individuals with and without family history of angina pectoris showed a mean Lp (a) of 27.71 ±14.60 mg/dL and 24.55 ±8.23 mg/dL (p= 0.02) respectively; vascular disease of the brain: 31.93 ±13.39 mg/dL and 27.63 ±14.55 mg/dL (p <0.01), myocardial infarction: 28.00 ±13.95 mg/dL and 27.36 ± 15.12 mg/dL; high blood pressure: 27.39 ±14.28 mg/dL and 28.34 ±15.10 mg/dL. Patients with and without a personal history of myocardial infarction showed a mean Lp (a) 33.88 ±16.70 mg/dL and 27.62 ±14.51 mg/dL respectively; high blood pressure: 29.31 ±14.67 mg/dL and 27.30 ±14.48 mg/dL; angina pectoris: 24.55 ±8.23 mg/dL and 27.71 ±14.60 mg/dL (p<0034); vascular disease of the brain: 31.93 ±13.39 mg/dL and 27.63 ±14.55 mg/dL.
Conclusions: these results are consistent with international studies which consider the hyperlipoproteinemia (a) where the value exceeds 30mg/dL. We consider extreme values, concentrations of Lp (a) less than 10.70 mg/dL and more than 47.39 mg/dL. We suggest that Lp (a) could play an important role in the incidence of angina pectoris and stroke.

No conflict of interest

P-1039

Atherogenic profile in diabetes mellitus - a Nigerian report

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Aims: Diabetes mellitus (DM) is a disorder that is often associated with cardiovascular events and underlying lipid abnormalities. This report seeks to determine the atherogenic profile of in DM.
Methods: A total of 600 patients with DM aged between 22 – 79 years were evaluated for lipid abnormalities. The anthropometric indices, glycosylated haemoglobin, and pattern of DM treatment were noted. Total cholesterol (TCHOL), triglyceride (TG), high density lipoproteins (HDL) and low density lipoproteins (LDL) cholesterol were measured. Test statistic used included student's t test and X^2.
Results: The mean (SD) age and age range of the study subjects was 58 (10) years and 22-79 years respectively.The ratio of subjects with type 1 to 2 DM was 15:565. The prevalence of lipid abnormalities was 89%. The prevalence of elevated LDL-C, reduced HDL, and elevated TG were 74%, 53%, and 13% respectively. The prevalence of elevated TCHOL/HDL ratio was 56% with a female preponderance. There were notable gender, type of DM and BMI impact on TCHOL and LDL, TG and HDL respectively.
Conclusions: The prevalence of lipid abnormalities of Nigerian patients with DM is high and the pattern of abnormalities differ from what obtains elsewhere.

No conflict of interest

P-1040

The efficacy and safety of rosuvastatin therapy in Korean dyslipidemic type 2 diabetes mellitus patients who can not reach the LDL cholesterol target at initial dosage of another LDL lowering agents

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Background: Elevated serum cholesterol level induces cardiovascular disorder. Cardiovascular disease is the major cause of morbidity in patients with type 2 diabetes mellitus and hypercholesterolemia. But many type 2 diabetes mellitus patients do not reach the lipid treatment target. Rosuvastatin is 3-hydroxy-3-methylglutaryl coenzyme A (HMG-CoA) reductase inhibitor, whichis highly effective in lowering total and low-density lipoprotein (LDL) cholesterol. This study was designed to evaluate efficacy and safety of 6-week therapy with rosuvastatin in Korean patients with Diabetes mellitus and hypercholesterolemia.
Subjects and Methods: This study was a prospective, non-blinded, open-label, non-comparative phase 4 trial. A total of 181patients with diabetes mellitus and hypercholesterolemia (LDL cholesterol > 100 mg/dL), which can not show the effectiveness at initial dosage of another LDL lowering medicines were included. All patients were randomized to receive rosuvastatin 10 mg once a day for 6 weeks. Efficacy was determined by measuring percent changes of lipid parameter including LDL cholesterol, total cholesterol (TC), triglycerides (TG) and high-density lipoprotein (HDL) cholesterol from baseline at week 6.
Results: After 6 weeks, 10 mg of rosuvastatin significantly reduced LDL cholesterol level from baseline (from 127.37mg/dl to 83.54mg/dl, -33%, p <0.001), but not TC, TG and HDL cholesterol (-21%, 1% and 0%, respectively). 89.9% of patients (n=149) who failed to reduce LDL-cholesterol with another LDL lowering agents, reached LDL-cholesterol goals of NCEP ATP III guideline with rosuvastatin 10mg daily. During medication neither significant adverse events nor discomforts that lead to discontinuation of the drug has been observed.
Conclusion: This study indicates that 10 mg of rosuvastatin produces remarkable reductions in LDL cholesterol without adverse effect in Korean patients with diabetes mellitus and hypercholesterolemia. Rosuvastatin treatment was well tolerated. It should be prescribed to allow most patients to reach their NCEP target level. So, this result suggests that rosuvastatin is an effective drug for lowering LDL cholesterol in type 2 diabetes mellitus with hypercholesterolemia.

No conflict of interest

Blood pressure

P-1041

Effect of valsartan on circulating adiponectin level in type 2 diabetes mellitus patients with hypertension

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Aim: Angiotensin II receptor blocker has been shown to have beneficial effect on angiopathy of hypertension and glucose metabolism. Adiponectin is also known to have anti-atherogenic and anti-diabetic effect. We investigated the effect of valsartan on circulating adiponectin level and insulin sensitivity in type 2 diabetic patients with hypertension.
Methods: Total 91 (38 men, 53 women) type 2 diabetes patients with mild to moderate hypertension treated with valsartan 80 mg for 4 weeks. The dose was then raised to 160 mg and treatment was continued another 8 weeks. Blood pressure, circulating adiponectin and metabolic parameters were measured before and after treatment. Homeostatis model of assessment insulin resistance (HOMA-IR) was calculated for insulin sensitivity index.
Results: Valsartan treatment significantly decreased mean blood pressure (P<0.001) and increased circulating adiponectin level (P<0.05). There were no differences in metabolic parameter, including HOMA-IR, fasting glucose, insulin, HbA1c and lipid levels before and after treatment.
Conclusions: Our result indicated that valsartan increases the circulating adiponectin but did not change insulin sensitivity in type 2 diabetic patients with hypertension.

Conflict of interest:
Commercially-sponsored research: S. Chang, J.M. Yu, K.W. Min, Novartis

P-1042

Hypertension characteristic in patients with metabolic syndrome

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Background: Hypertension is feature of the Metabolic Syndrome (MS). However, the characteristics of the 24-hour ambulatory blood pressure monitoring (ABPM) in patients with MS are not so well known. Aim of this study was to investigate the clinical characteristics of hypertension in patients with MS by ABPM.
Methods: We studied 60 subjects with MS according to IDF criteria (36 men, mean age = 48±13 years, BMI = 33±5 kg/m2, waist circumference (men) = 114±11 cm, (women) = 109±10 cm) and 20 control hypertensive lean subjects. History, physical examination, ECG, ABPM, lipids, fasting glucose and insulin measurements were performed. All patients with MS were insulin resistant (mean HOMA-IR = 5.8±3.6). Hypertension were diagnosed in 88.3 % (n=53) patients with MS according to current guidelines. Non-dipping was defined as a less than 10% fall in systolic ABP from day to night. BP variability was evaluated as the standard deviation day and nighttime ABP.
Results: The characteristics of hypertension in patients with MS by ABPM were systolodiastolic hypertension daytime, systolic hypertension nighttime, high pulse pressure (PP), high "pressure-time index" (PTI) day and nighttime and prevalence of non-dipping status. Hypertensive patients with MS compared with control group had higher systolic ABP daytime (p = 0.028); higher PP (p = 0.00005); higher systolic PTI daytime (p = 0.006) and nighttime (p = 0.028); higher BP variability of systolic, diastolic day and nighttime ABP; impaired dipping status with 58% prevalence of non-dippers in hypertensive and normotensive patients with MS (p < 0.012).These results demonstrated possible links between insulin resistance and hypertension.
Conclusions: Our study has shown special characteristics of the ABPM in patients with MS that included high systolic ABP daytime, high PP, high systolic PTI, BP variability and prevalence of non-dippers.

No conflict of interest

P-1043

Comparative study of telmisartan, ramipril and combination thereof in diabetes with nephropathy and hypertension

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Aims: To evaluate therapeutic efficacy of ramipril, telmisartan alone and in combination in the control of hypertension, microalbuminuria and overt proteinuria in diabetic nephropathy with hypertension.
Methods: 42 consecutive cases of diabetic nephropathy were selected who had serum creatinine levels < 3 mg% and good hyperglycaemia control and systolic BP between 100 and 210 mmHg, but excluding cases with malignant hypertension and renovascular hypertension.They were were randomized into 3 treatment groups,ramipril,telmisartan and combination therapy,each of which was further subdivided into A and B subgroups on the basis of microalbuminuria and overt proteinuria respectively.Group1 (14 cases) was given Telmisartan 40 mg OD.
Group 2 (12cases) was given Ramipril 10mg BD, and Group 3 (16 cases) was given combination Telmisartan 20mg and Ramipril 5 mg OD.
The cases were assessed for blood pressure, microalbuminuria, overt proteinuria, serum creatinine, blood urea, creatinine clearance, serum sodium, serum potassium, serum uric acid, blood sugar, HbA1c, serum bilirubin, SGPT and SGOT at 8 weeks interval for 24weeks i.e. at 8, 16, and 24 weeks.
Results: Microalbuminuria decreased significantly in all 3 groups 30.1% with Telmisartan, 34.5% with Ramipril and 35.5% with the combination. Overt proteinuria subgroups also showed significant decrease in all the three arms Telmisartan (22.2%), Ramipril (22.2%) and combination (35.5%).These decreases were significantly greater in the combination groups.Significant reduction in systolic blood pressure was also seen:11.38%, 11.44% and 13.16% respectively. Diastolic blood pressure was also reduced in the three groups 8.35%, 9.04% and 11.44% respectively. The decrease in systolic and diastolic BP did not differ significantly between these 3 groups.There were no significant changes in creatinine clearance, serum creatinine, blood urea, uric acid and SGPT (Al T) levels after 24 weeks of treatment in all 3 groups.

Conclusion: Combination therapy with Ramipril and Telmisartan is superior to the individual agents in reduction of both microalbuminuria and overt proteinuria..

No conflict of interest

P-1044

Do sympathetic outflow and protein kinase A play any role in the Na+/glucose co-transporter SGLT1 in the salivary gland of diabetic hypertensive rats ?

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Salivary dysfunction has been described in hypertension and diabetes, and the SGLT1 that carries 2 Na^+:1 glucose:264 water molecules plays a critical role in these diseases. The sympathetic activation leads to interaction of ß-adrenoreceptor with ß-agonists that can activate the protein kinase A to trigger the migration of SGLT1 to plasma membrane. In Wistar Kyoto (WKY), WKY-diabetic (WKY-D), spontaneously hypertensive (SHR) and SHR-diabetic (SHR-D) rats, parotid and submandibular glands were harvested for SGLT1/PKA mRNA and protein analysis. Moreover, the salivary glands sympathetic activity (SGSA) was directly monitored. The SGSA increased in SHR and SHR-D (~300%, $p<0.05$) and decreased in WKY-D (45%, $p<0.05$), when compared to WKY. In salivary glands, the regulation of catalytic subunit of PKA was parallel to the sympathetic activity increase in SHR and SHR-D (~60%, $P<0.001$) and reduction (~30%, $p<0.05$) in WKY-D, compared to WKY rats. Besides, the plasma membrane SGLT1 protein content was increased in SHR and SHR-D (~200%, $p<0.001$) and reduced in WKY-D (~45%, $p<0.05$). However, in salivary gland, compared to WKY, the SGLT1 mRNA was increased (~40%, $p<0.05$) by diabetes and/or hypertension. Furthermore, immunohistochemical analysis showed SGLT1 staining in luminal membrane of ductal cells of diabetic and/or hypertensive rats, which is likely involved with water uptake, reducing the salivary flow. As expected, nonstimulated salivary secretion was reduced (~40%, $p<0.001$) in WKY-D, SHR and SHR-D rats. Together, our data suggest that dysfunction of the sympathetic outflow observed in hypertensive and diabetic state might be strictly related to changes in the SGLT1 protein of salivary glands via PKA and the functional alterations in salivary secretion can be mediated by SGLT1 in luminal membrane of ductal cells.

No conflict of interest

Complications - biochemical mechanisms

P-1045

Prevalence of various forms of cancer in patients with type 2 diabetes mellitus

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Background and aims: Association between diabetes mellitus (DM) and cancer has long been speculated. Thus, the aim of our work was to prospectively examine association between a history of DM and subsequent risk of cancer in Georgian Public Oncology Center.

Materials and methods: In total we analyzed data for 270 patients (pts) with DM and various forms of cancer (females 139/males131, age range 55-75, DM duration 11±6yrs, BG 10.8±1.8mmol/l). Most frequently observed form was breast cancer (BC). Its incidence particularly increased in postmenopausal women. Data of women aged 55-69 yrs were analyzed. Family history of DM as well as BC was not associated with risk of postmenopausal BC in these pts, though DM in anamnesis enhanced the magnitude of the association of BC family history with postmenopausal BC (relative risk 1.87 vs. 1.36). The 2nd leading cancer form was rectal cancer (RC). Its prevalence was the highest in pts on energy-dense, poor in vegetables and fruit diet, or those leading sedentary life. Highest prevalence of RC was observed in men, aged 55-75 yrs. Pts were in clinical stage 2-T4NoMo; stage 3-pT2N1Mo; stage 3-T2NoMo; stage 2-T3NoMo; stage 3-T3NoMo; stage 2-PtNM; pT3C3NoMoRo. All were smokers. The 3rd position occupied stomach (SC) and pancreas (PC) cancers. SC was particularly located in antrum. Most of them were in clinical stage 3, with T3NoMo. All were smokers. Pts (males 50/females 20) with PC had particularly increased total bilirubin and acid phosphatase levels.

Results: Out of 270 cases of cancer analyzed the share of BC was 38%, RC 28% (males 20%/females 8%), SC 10% (all men), PC 10% (males 7%/females 3%), Sigma cancer 5%, Mediastinal lymphoma 5%, hemangioma 4%.

Conclusions: Patients with DM may be at increased risk of total cancer and cancer in specific sites. Further observation and analyzes are desirable.

No conflict of interest

P-1046

Thyroid function tests in women with GDM and pre-gestational diabetes mellitus

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Diabetes is the most common endocrine dysfunction during pregnancy that can be divided to two groups (GDM, pregestational diabetes mellitus).Pregnant women with diabetes may have coexisting thyroid dysfunction so we decided to study thyroid function tests in GDM and pregestational D.M.

This study is a cross sectional prospective study in a group of 61 pregnant women that referred to endocrine clinic of Golestan Hospital (Ahwaz, Iran). They were between 19 to 47 years old.

From 61 patients, 22 person (36.07%) had GDM and 39 person (63.93%) pregestational D.M. Thyroid dysfunction was detected in 11 person (18%) (4.5% of women with GDM and 25.6% with pregestational D.M).

There was significant difference in thyroid dysfunction between GDM and pregestational D.M. ($p=0.037$)

27.3% of women with GDM and 35.7% of women with pregestational D.M had positive titer of anti TPO Ab, 10% of women with GDM and 12% of women with pregestational D.M had high level of anti Tg Ab.

From 61 patients 21.3% had previous history of thyroid disorder. Thyroid dysfunction was detected in 25% of these patients during pregnancy. There was not significant correlation between previous history of thyroid disease and thyroid dysfunction during pregnancy. ($p=0.311$).

Conclusion: Thyroid dysfunction is prevalent in women with pregestational D.M so thyroid function should be evaluated in these patients during pregnancy. Thyroid dysfunction was not prevalent in women with GDM but 27.3%of them had positive titer of TPO Ab that should be followed in post partum period because of high prevalence of post partum thyroiditis in these.

No conflict of interest

P-1047

Evaluation of liver function tests in type 2 diabetes mellitus

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The study titled "Evaluation of Liver Function Tests in Type-2 Diabetes Mellitus" was conducted at Government Medical College, Jammu with a view to: study the pattern of liver function test abnormalities in type-2 diabetic patients, and to determine if the liver function abnormalities had any association with glycemic control.

The study comprised 206 subjects, of which 3 tested positive for viral hepatitis (2 for hepatitis-B and 1 for hepatitis-C viruses). Only 203 subjects were, therefore, included in statistical evaluation of the results.

The mean age of the subjects was 51 ± 7.1 years. The minimum age of the patients in the study group was 34 and the maximum age was 77 years. The study group comprised 97 males and 106 females.

The most prevalent liver function abnormality was elevation in the serum level of ALT (33.5%), followed by GGT (17.7%) and AST (17.1%) in that order. The prevalence of abnormal serum bilirubin (4.43%) and serum alkaline phosphate (4.9%) was only marginal.There was a positive and significant correlation between glycemic control and the liver enzymes viz., ALT, AST and GGT.Fasting plasma glucose was found to be positively and significantly related to the serum levels of the three liver enzymes viz., ALT, AST and GGT.There was a significant and positive correlation between HbA1c and each of the three liver enzymes ALT, AST and GGT. Patients with raised level of serum triglycerides generally had liver function test abnormalities as is borne out by highly significant ($p < 0.001$) positive correlations between serum triglycerides on the one hand and serum levels of ALT and GGT on the other.

Increased body mass index (BMI) also contributed to liver function test abnormalities. Thus, a highly significant ($p < 0.0001$) and positive correlation existed between BMI and the three enzymes ALT, AST and GGT.

Waist circumference, known to be an index of insulin resistance, contributed to liver function test abnormalities. This is borne out by highly significant and positive correlations observed between waist circumference and the three liver enzymes viz., ALT, AST and GGT.
A large majority of patients (90.5%), who had abnormal levels of serum ALT, were on ultrasonography found to have fatty liver suggesting that most patients with type-2 diabetes with abnormal ALT also have fatty liver.
It is concluded from the study that the likelihood of having elevated levels of serum aminotransferases and serum gamma glutamyl-transferase is greater among type-2 diabetics leading to non-alcoholic fatty liver disease. In addition, dyslipidemia, poor glycemic control, increased body mass index and increased waist circumference further contribute to the fatty liver disease.

No conflict of interest

P-1048

Anemia is associated with an elevated serum level of high molecular weight adiponectin in patients with type 2 diabetes independently of renal dysfunction – link between high serum adiponectin and increased mortality

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Objective: In recent, high serum adiponectin is reportedly associated with an increased risk of cardiovascular disease or high mortality in patients with congestive heart failure. Anemia is strongly associated with an adverse outcome and increased mortality in patients with coronary heart disease or diabetic nephropathy. We investigated whether anemia was independently associated with the serum level of high molecular weight (HMW) adiponectin in patients with type 2 diabetes.
Subjects and Methods: We studied 207 type 2 diabetic patients (92 women and 115 men). Anemia was defined as a hemoglobin (Hb) <13.0 g/dl in men and <12.0 g/dl in women. Overt nephropathy (CKD) was defined as clinical proteinuria and /or estimated glomerular filtration rate (eGFR) lower than 60 ml/min for more than 3 months. The diabetic patients were divided into four groups according to the presence or absence of anemia and/or CKD. Serum HMW adiponectin levels were measured by a sandwich enzyme-linked immunosorbent assay.
Results: In all 207 patients with type 2 diabetes, serum total and HMW adiponectin levels were correlated positively with age, the duration of diabetes, HDL cholesterol, urinary albumin, and serum erythropoietin, while there were negative correlations with body mass index, triglyceride, eGFR, Hb, hematocrit, and high sensitivity C-reactive protein. Stepwise regression analysis demonstrated that among a number of significant variables, Hb had the strongest independent influence on HMW adiponectin (b= -0.487, P<0.001). Diabetic patients of both sexes with anemia and CKD had the highest serum levels of HMW adiponectin among the four groups.
Conclusions: Anemia is associated with marked elevation of serum HMW adiponectin levels in diabetic patients who have CKD, and this elevation is independent of renal function.

No conflict of interest

P-1049

Leukocyte telomere attrition is evident in obese children and is not associated with insulin resistance

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Aims: Advances in studies of obesity highlight the importance of adipocytokines in the development of insulin resistance which in turn leads to biological senescence. In this study we attempt to determine for the first time associations of telomere length to markers of insulin resistance and obesity in Saudi children.
Methods: 148 subjects (69 boys and 79 girls) participated in this cross-sectional study. General information, anthropometric data and fasting blood samples were collected. Serum glucose and lipid profile was done using routine lab methods. Serum insulin, leptin, adiponectin, resistin, TNF-alpha and aPAI-1 were quantified using customized multiplex assay kits. C-reactive protein and ANG II were quantified using enzyme-linked immunosorbent assays. Leukocyte telomere length was examined by quantitative real time PCR utilizing the IQ cycler.
Results: Mean telomere length of obese children was not significantly different from their lean counterparts. Telomere length was not associated to insulin resistance in both boys and girls. In girls, significant predictors of telomere length were adiponectin level and the waist circumference. Correlation analysis revealed that telomere length is not associated to any of the metabolic parameters measured, including HOMA-IR, indices of obesity, lipid profile and glycemic parameters. Regression analysis revealed that adiponectin and waist circumference predicts 61% of variance in telomere length only in girls ($p < 0.0001$).
Conclusion: Insulin resistance is not associated to telomere length attrition among girls, but is evident among obese boys. Further studies are needed to determine as to whether the length can be used as biomarker for other obesity-related diseases in the same population.

No conflict of interest

P-1050

Clinical and laboratory correlates of non-alcoholic steatohepatitis and advanced fibrosis in Brazilian type 2 diabetic patients

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Aims: Increasing evidence suggests that patients with diabetes are at a particularly high risk for presenting non-alcoholic fatty liver disease (NAFLD), especially in its more severe progressive form, non-alcoholic steatohepatitis (NASH). Data regarding the prevalence and the factors associated with NASH in diabetic patients are still scarce. The aim of this study was to investigate in type 2 diabetic patients the prevalence and associated factors of NASH and advanced fibrosis.
Methods: In a cross-sectional study, 180 type 2 diabetic patients were submitted to a complete clinical and laboratory examination. Fasting serum samples were assayed for adiponectin, TNF-alpha, TGF-beta, IL-6, IL-8 and IL-10 (LINCOplex assay). An abdominal ultrasonography (US) for NAFLD detection and grading was performed. Those with abnormal aminotransferases levels or steatosis on US were submitted to liver biopsy. Exclusion criteria were daily alcohol ingestion > 20g, other coexistent liver diseases, the use of well-known hepatotoxic drugs and any contraindication to liver biopsy. Percutaneous liver biopsy was performed using the 14G Bloodline needle. Liver histology was assessed by pathologists who were blinded to the clinical data. The histological grading and staging of NAFLD followed the Kleiner's criteria. Advanced fibrosis was considered for patients with fibrosis stage 2 to 4. Categorical parameters among groups were compared using the Chi-squared test. For continuous parameters Student`s t-test and Mann-Whitney test were applied. Statistical significance was taken as $p < 0.05$.
Results: Among the 67 diabetic patients submitted to liver biopsy, 65.7% were female with a mean age of 54.8 (sd=7.16) years. NASH was identified in 44 (65.7%) and advanced fibrosis in 54 (80.6 %). Older age (p=0.038), high serum triglycerides (p=0.010), low high-density lipoprotein (p=0.012), ast/alt ratio (p=0.022), lower adiponectin levels (p=0.019) as well as adiponectin/TNF-alfa ratio (p=0.014) were associated with diagnosis of NASH. Remarkably, the use of statins was related to a lower prevalence of NASH on liver biopsy (p=0.006). The factors related to advanced fibrosis were weight (p=0.038) adiponectin levels (p=0.011) and adiponectin/TNF-alfa ratio (p=0.001).
Conclusions: Our data indicate that NASH and advanced fibrosis are highly prevalent in type 2 diabetic patients. The lack of association between diabetes related parameters and NASH or advanced fibrosis may suggest that NAFLD in type 2 diabetic patients may follow a progressive course independent of the diabetes itself. The imbalance of the cytokines adiponectin and TNF-alfa ratio may have a role in NAFLD progression in diabetic patients.

No conflict of interest

P-1051

Diabetes as a risk factor of colon neoplasms in overweight and obese patients

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Aims: The aim of the study was to assess the incidence of neoplastic changes in patients with type 2 diabetes, who underwent colonoscopy from May 2005 to December 2006. The relation between incidence of neoplastic changes and anthropometric factors was evaluated.

Materials and methods: Colonoscopy was performed in 282 patients: 57 patients with obesity (35 women and 22 men; mean age 61,8±12,5), 99 with overweight (53 women and 46 men mean age 65,2±14,4). The control group comprised 126 patients (BMI<25) (37 men, 89 women, mean age 60,7±16,7 years). Anthropometric parameters (eg. BMI, WHR, waist circumference) were measured. In patients with macroscopic colorectal lesions, histopathological evaluation was performed. Subsequent statistical analysis involved application of Students' t-test and logistic analysis.

Results: Adenocarcinoma was more frequent (p= 0,01) in patients with type 2 diabetes. The most accurate and statistically significant logistic regression model (that includes all risk factors) confirmed the role of diabetes. Coexistence of diabetes increases 6-fold the risk of colon cancer p=0,02. We did not find positive correlation between the presence of diabetes and colon polyps (p=0,2). Colon polyps were observed more frequently in obese compared to lean (20%; p=0,02) and overweight (25%; p=0,1) patients. We observed increased frequency of colon polyps in patients with obesity independently of age, waist circumference and independently of the presence of diabetes. Obesity increases 1,5-fold the risk of colon polyps.

Conclusion: Diabetes type 2 is important risk factor of colon cancer. Obesity increases the risk of colon polyps independently of age, diabetes or other anthropometric parameters.

No conflict of interest

P-1052

Biogenesis of methylglyoxal-adducts is associated with LDL and triglyceride levels: implications for diabetic atherosclerosis

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Aims: Protein glycation leading to AGEs is enhanced in diabetes by increases in blood glucose per se, and collaterally, by endogenous production of reactive carbonyls. Low weight a-dicarbonyls are formed as glycolytic intermediates during metabolic conversion of glucose and/or during lipid peroxidation. Among AGE precursors, methylglyoxal (MG) is considered as one of the key intermediates. We hypothesized it to be a common product of both carbonyl and oxidative stress, and investigated the MG biogenesis in relation to glycemic and lipid status in diabetic patients.

Methods: Serum and urine MG-adduct content was measured by DELFIA method in 88 diabetic patients and 20 controls. Fasting (FG) and postprandial (PPG) glucose level, HbA1c, glucose profile M-index, LDL and HDL cholesterol, plasma triglyceride and homocysteine levels were determined.

Results: A significant positive relationship was observed between serum level of MG-adducts and LDL (r=0.31 p=0.003) whereas fasting glucose correlated inversely (r= -0.33 p=0.001) as well as postprandial glucose (r= -0.23 p=0.041) and HbA1c (r= -0.22 p=0.036). Similarly, significant correlations were also found between urinary levels of MG-adducts and postprandial glucose (r= -0.28 p=0.023), serum triglycerides (r=0.31 p=0.003), homocysteine (r=0.57 p=0.0007), HDL (r= -0.28 p=0.007) and urine albumin/creatinine ratio (r=0.53 p=0.002). Multiple linear regression was performed using serum or urine MG-adducts as dependent variable and HbA1c, fasting and postprandial glucose, LDL, HDL, triglycerides, serum creatinine, homocysteine and urine albumin/creatinine ratio as independent variables. Of these, only LDL-cholesterol and FG were independently associated with MG-adducts in serum (p<0.00046), whereas urine albumin/creatinine ratio, PPG, HDL and triglycerides were independently associated with urine MG-adducts (p<0.011). Patients with LDL-cholesterol >3.0 mmol/l, had a higher serum level of MG-adducts (616±400 mgEq/ml (range 183-2066) vs 424±237 mgEq/ml (53-1370); p=0.026). In addition, significant correlation between homocysteine and urinary excretion of MG-adducts (r=0.8; p=0.02) was recorded in patients with a history of macrovascular disease.

Conclusion: A highly significant relationship between LDL and MG-adduct production, as well as tight correlation between triglycerides and urinary MG-adduct excretion suggest that lipoxidation and glyceraldehyde-3-phosphate route, along with the glycolytic pathway, might be an important source in MG generation. The glycotoxin methylglyoxal seems to be a common factor linking the two dominant metabolic changes in diabetes, hyperglycemia and intensive lipolysis, with vascular pathobiochemistry of diabetes.

No conflict of interest

P-1053

Clinical and biochemical assessment of testosterone deficiency in men with type 2 diabetes

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Aims: The relationships among type 2 diabetes mellitus, obesity, metabolic syndrome, serum total and free testosterone levels are complex and often confusing to the physician. It is known that BMI is inversely proportional to serum total testosterone concentrations. The aim of our study was to assess the prevalence of testosterone deficiency in men with type 2 diabetes.

Methods: In a cross-sectional study of 255 type 2 diabetic men aged >30 years, total testosterone, BMI, and waist circumference were measured and free testosterone was calculated. Overt hypogonadism was defined as the presence of clinical symptoms of hypogonadism and low testosterone level (total testosterone <8 nmol/l). Borderline hypogonadism was defined as the presence of symptoms and total testosterone of 8–12 nmol/l.

Results and discussion: A low blood testosterone level was common in diabetic men, and a significant proportion of these men had symptoms of hypogonadism. Overt hypogonadism was seen in 17% of men with total testosterone <8 nmol/l. Borderline hypogonadism was found in 25% of men with total testosterone 8–12 nmol/l; 42% of the men had free testosterone <0.255 nmol/l. BMI and waist circumference were both significantly negatively correlated with testosterone levels in men, with the association being stronger for waist circumference.

Conclusion: Testosterone levels are frequently low in men with type 2 diabetes, and the majority of these men have symptoms of hypogonadism. Obesity is associated with low testosterone levels in diabetic men.

No conflict of interest

P-1054

White blood cells apoptosis and blood immune indexes in patients with diabetes mellitus

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Aims: Immune response alterations in Diabetes Mellitus (DM) were shown in many studies, and explained by different mechanisms by hyperglycemia and insulin deficiency states, and we are proposing that blood white cells apoptosis may be one of the reason. So investigation of the relationship between blood immune indexes and white blood cells apoptosis, glycemia and HbA1c level present the aim of this study.

Methods: In 42 patients with type 2 DM and 12 healthy subjects (HS) fasting blood glucose (FBG), HbA1c level, blood total T cells (CD3), B-cells, T-helpers (CD4), T-suppressors (CD8) were tested, white blood cells apoptosis detected by counting through light microscopy after trypan blue and RH-stain and express as index of apoptosis IA= (apoptotic cells/total cells) x100%.

Results: In patients with DM, FBG and HbA1c were increased 2.1 and 1.7 times compared with HS. Total B-cells was significantly decreased in 1.3 times, CD3 decreased in 1.16 times (NS), CD4 - in 1.13 times (NS), and CD8 - in 1.4 times, P<0.05 and relation CD4/CD8 was decreased in 1.56 times, P<0.05 in DM patients and shown suppression of immune response, whereas blood cells apoptosis expressed as IA was significantly increased in 1.98 times in DM patients in compare with HS. IA shown linkage with FBG, and CD3, CD4, CD8 indexes which permit to view the white blood cells apoptosis as a reason of immune response dropping at the DM.

Conclusion: In DM patients white blood cells apoptosis increased and had linkage with FBG, CD3, CD4, CD8 indexes and viewed as a one of reason of dropping immune response.

No conflict of interest

P-1055

Correlation of highly sensitive C reactive protein with components of metabolic syndrome

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Background: C reactive protein (CRP) is an important marker of proinflammatory state, correlated with cardiovascular and cerebrovascular morbidity. The metabolic syndrome has components that translate into vascular events, and it is well known that CRP can be raised in this syndrome. This study was undertaken to identify which of these components correlates most with CRP levels.
Objective: To study the relationship of CRP with components of metabolic syndrome.
Methodology: The study was carried out in the department of medicine, Kasturba Medical college, Manipal, India between January 2006 to July 2007. Patients with ethnic specific criteria for metabolic syndrome (FBS>110mg/dl, BP>130/85mm Hg, TG>150mg/dl, HDL<50mg/dl in women, <40mg/dl in men, Waist >80cm in women, 90cm in men) were screened for highly sensitive CRP levels by particle enhanced immunoturbidometry. All patients with chronic liver, kidney disease, infections and inflammatory conditions, malignancy were excluded. The data was analysed using SPSS 15 version. Non parametric Mann Whitney U test was used to assess statistical significance.
Results: Out of 91 patients screened, 24 were females, 67 were males, with 90% being more than 40yrs of age. FBS high in 80%, hypertension (HT) in 63%,waist circumference abnormal in 79%,TG high in 74%, low HDL in 45%. The mean CRP was found to be significantly higher in patients with FBS>110mg/dl compared to those without (1.72 vs 0.90,p value of 0.021) and among hypertensives and non hypertensives, (CRP 1.83 vs 1.15, p value of 0.038). The most significant difference was for abnormal waist circumference (WC), CRP being 1.76 compared to 0.72 in those with normal WC (p value of 0.003). However there was no significant difference in groups with and without raised TG (p value 0.834),or patients with low or normal HDL (p value of 0.902). Multiple regression analysis with CRP as dependent variable showed that WC correlated best (p value 0.039) along with hypertension (p value 0.028).
Further analysis was done with division of patients into those with 3, 4 or 5 components of metabolic syndrome. CRP was 1.21, 1.80 and 2.29 respectively, showing that CRP increases with increasing clusters of MS components (p value 0.008).
Conclusion: A positive correlation was found between CRP and components of MS such as central obesity, hypertension, and fasting glucose, with waist circumference correlating best. There is a linear increase in CRP with increasing number of components of MS (p value 0.008). CRP is thus an important surrogate marker for chronic inflammation related to atherosclerosis which may explain its close relationship with components of the metabolic syndrome.

No conflict of interest

P-1056

Stroke and insulin resistance in sub-Saharan African patients presenting with first-ever-in lifetime stroke

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Background and purpose: The incidence of cardiovascular diseases is increasing in developing countries. Insulin resistance syndrome is associated with an increased risk of stroke. To assess insulin sensitivity of patients with first stroke episode in hospital setting in Cameroon.
Methods: All patients admitted for first-ever-in-lifetime stroke over a 6-month period were eligible for the study. The 84% participation rate yielded 57/68 patients aged 16-85 years. Fifty seven control subjects were selected to match patients included for age range, sex, and known hypertension and diabetes. We measured fasting serum glucose, insulin, and lipids in controls and in patients between day 3 and 7 following admission.
Insulin sensitivity was assessed using the Quantitative Insulin Check Assay (QUICKI) and the Homeostatic Model Assessment of insulin sensitivity (HOMA).
Results: Fasting insulin level was higher in patients than controls (5.9±5.4 vs. 2.3±3.2 IU/ml, p<0.001). Patients were less sensitive to insulin than controls as measured by QUICKI (0.17±0.04 vs. 0.28±0.12, p<0.001) and HOMA-IR (1.9±2.2 vs. 0.7±1.0, p=0.001). The assessment of lipids showed comparable total cholesterol in patients and controls (172.6±39.5 vs. 175.4±49.7 mg/dl, P=0.75) as were triglycerides (129.4±56.1 vs. 122.4±60.7 mg/dl,P=0.53). HDL-C levels were lower in patients than in controls (37.4±20.6 vs. 50.2±18.0mg/dl; P=0.001), with comparable levels of LDL-cholesterol (109.4±43.0 vs. 100.7±48.8mg/dl, P = 0.32). The LDL-C/HDL-C ratio was higher in patients compared to controls (4.0±3.0 vs. 2.3±1.7, P=0.0001), as well as the total cholesterol / HDL-cholesterol ratio (5.9±3.5 vs. 3.9±1.8, P=0.0001).
Conclusions: Stroke is associated with markers of insulin resistance, low serum levels of HDL and high TC/HDL ratio in this African population. Studies on bigger sample size, and cohort designs are warranted to explore the causal pathways, persistence of these abnormalities and population-specific cut points.

No conflict of interest

P-1057

Mannose-binding lectin levels and carotid intima media thickness in diabetic patients

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Background: Mannose-binding lectin (MBL), a weak acute phase reactant protein activates the "lectin" pathway of complement system, independent of antibodies and plays an important role in the innate immunity. MBL level has been associated with diabetic nephropathy. Also, MBL has been suggested to be involved in the pathogenesis of micro- and macrovascular complications, and may be used as a prognostic marker for these complications. No study up to date, has investigated the association of MBL level and carotid artery intima media thickness (IMT).
Objectives: To analyze a possible association and role of MBL in pathogenesis of IMT, in diabetic patients.
Materials and methods: Serum MBL levels and IMT were measured in a total of 151 diabetic patients, 76 type1 diabetes (T1D) with mean age 46.0±11.5 years and 75 type 2 diabetes (T2D) with mean age 47.4±8.2 years, and were compared with 118 healthy controls (mean age 45±9.7years).MBL levels were measured by sandwich ELISA technique using murine monoclonal antibodies (HYB131-01, HYB131-01B). IMT on both sides were measured using B mode enlarged images. Data including socio-demographic factors and clinical information for all cases and control subjects was collected and analyzed statistically with Newman-Keuls ANOVA and simple correlation analysis.
Results: Logarithmic MBL levels in T1D was 2.7±0.5 ng/ml; T2D was 2.8±0.5 ng/ml ;in controls was 2.7±0.6 ng/ml and there was no significant difference between either groups (p>0.05). Glucose homeostasis was not different between 2 diabetic groups as shown by HbA1c results (T1D: 8.3±1.7 % and T2D: 8.1±1.6 %). Statistically IMT was significantly higher in diabetics compared to controls (p=0.046). Subgroups of patients with absolute and relative MBL deficiency (<100, <500ng/ml respectively) and high MBL level (>1000ng/ml) were analyzed separately. Patients with MBL >1000, had higher IMT (p=0.04) than patients whose MBL <1000. IMT in T2D was significantly higher than controls (p=0.05). In patients with >1000MBL, IMT in T2D was higher than T1D (p=0.041) and controls (p=0.037). IMT was inversely correlated with MBL in absolute deficient patients, in all diabetics (p=0.006) and T1D (p=0.04).
Conclusion: This is a first study investigating the role of MBL in carotid IMT. IMT was significantly higher in all diabetics and T2D versus controls. Also, in T2D with high MBL levels, IMT was higher than T1D and controls. In absolute deficiency, MBL was inversely correlated with IMT in T1D and whole diabetic population. We conclude that high MBL level and MBL deficiency may play a role in the pathogenesis of macrovascular complications in diabetic patients.

No conflict of interest

P-1058

Effect of pomegranate juice on paraoxonase 1 (pon1) gene expression and enzymatic activity in a streptozotocin-induced diabetes and diet-induced obese model

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Nutritional antioxidants such as pomegranate juice are a source of polyphenols and other antioxidants which can contribute to the reduction of oxidative stress and atherogenesis. When pomegranate juice was provided to apolipoprotein E-deficient mice with advanced atherosclerosis, the lesions were reduced by 17% compared with the placebo. A similar effect in PON1--deficient mice has been reported. However, pomegranate juice has been shown to reduce blood glucose levels and induce PON1 gene expression.

Aims: We created a unique streptozotocin-induced diabetes and diet-induced obese model to determine if pomegranate juice could be a treatment for the control of diabetes and obesity occurring together.

Methods: the model was used to test the effect of pomegranate juice on PON1 activity on the simultaneous occurrence of both diseases. The beneficial effects of pomegranate juice were measured when provided to diet-induced obese mice with streptozotocin-induced diabetes. All animals received an obesigenic diet designed by a nutritionist to include typical Mexican foods. Forty CD1 mice of approximately 20-30 g were rendered diabetic by a single i.p. injection of streptozotocin (80 mg/kg body weight). The control group received water ad libitum while the experimental group received water supplemented with pomegranate juice (12.5 mL/L of water). Immediately post-injection and 1, 2, 3 and 4 months after, mice were killed by decapitation and blood was collected. The blood was allowed to stand for 30 min at 4°C and then centrifuged to obtain serum. Glucose, cholesterol, and triacylglycerol levels were measured by a medical diagnostic kit. PON1 activity was measured by a semiautomated method using paraoxon as substrate. PON-1 gene expression was determined by RT-PCR.

Results: pomegranate juice increased the PON-1 gene expression levels compared to the unsupplemented group in proportion to treatment time. PON1 activity was significantly higher in the last month in the pomegranate juice-supplemented group. Additionally, we found that pomegranate juice significantly reduced blood glucose and cholesterol levels ($p<0.05$).

Discussion/conclusion: Although we did not study atherosclerosis lesions directly, the results suggest that pomegranate juice can be used as a preventive for the control of diabetes and for reducing atherosclerosis.

No conflict of interest

P-1059

Sexual dysfunction in women with diabetes mellitus

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Aims: This report is an attempt to document the prevalence, various aspects of sexual dysfunction (SD), clinical correlates and determinants of SD in Nigerian women with diabetes mellitus (DM).

Methods: A total of 64 married women with DM attending had their sexual function assessed using the Female Sexual Function Index questionnaire. The scores in the six domains were compared with that of 30 age matched women who did not have DM. Psychological status was assessed with the General Health Questionnaire.

Results: The prevalence of SD in women with DM and in the control population was 73% and 43% respectively. The mean (SD) FSF score in the diabetic women-16.5 (10) was significantly lower than that of the control group-21 (8.5), ($P = 0.03$).

Women with DM attempted sex less frequently than the control group. Poor mental health status was noted more in the DM (30%) than in the control group (16%) and this was found to be related to SD. However the duration of DM had a significant relationship to the presence of SD ($P=0.002$).

Discussion: Sexual problems are more frequent in women with DM than those without DM, and determinants of SD include duration of diabetes illness and poor mental health.

No conflict of interest

P-1060

Occurence of coeliac disease in children and adolescents with type 1 diabetes mellitus

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Background and Aims: The prevalence of Coeliac disease (CD) in children with autoimmune disorders (AD) greatly exceeds the prevalence in general population. Type 1 diabetes (T1DM) is one of the AD which has been described as associated to gluten sensitive enteropathy (1.1-10%). CD in diabetic kids is usually asymptomatic and untreated and may lead to unexplained hyperglycemia, blood glucose swings, growth failure, and weight loss. The aim of the study was to determine the prevalence of CD in children and adolescents with DMT1 in Georgia.

Materials and Methods: Totally, 32 patients (pts), (age range 1.6-15 yrs, males 17/ females 15) with T1DM and without signs of malabsorption were tested for antigliadin test (IgA and IgG AGA) and to tissue transglutaminase (IgA and IgG TTG). Pts were divided into 3 groups (Gr): Gr.1 (n=5) at T1DM onset; Gr. 2 (n=17) diabetes duration 2-7yrs, HbA1c >8% (9.3±1.1); Gr. 3 (n=10) same diabetes duration, HbA1c<7.5% (6.7±0.6). All pts were on intensive insulin therapy (HM insulins).

Results: IgA AGA was positive in 3 cases. IgA TTG was present in 5 pts. Using internationally accepted criteria, CD was diagnosed in 4 pts (12.5%)-1 from Gr.1, 3 from Gr. 2, none from Gr. 3.

Conclusions: 1. The TTG antibody test is more sensitive than AgA. 2. CD in diabetic pts is frequently asymptomatic and detected only through antibody screening. 3. Our study confirms the prevalence of CD in children and adolescents with T1DM, and that CD influences glycemic and metabolic control. 4. Children with T1DM should be screened for CD routinely.

No conflict of interest

P-1061

The investigation of the molecular effects of diabetes mellitus on rat testis tissue and treatment effect of ascorbic acid on diabetes mellitus

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Aims: Changes in spermatozoa production and decrease in amount of hormone secretion have been shown in testis tissues in long-term diabetes. The current study aims to investigate the molecular changes caused by diabetes in rat testis tissues and also the possible treatment role of high and low dose vitamin C administration in diabetes using Fourier Transform Infrared (FTIR) spectroscopy technique.

Methods: 11-week-Wistar male rats were divided into four different groups, namely; control (n=6), diabetic (n=6), and also low dose (15 mg/kg, n=6) and high dose ascorbic acid (100 mg/kg, n=6) that is administered to diabetic rats. Diabetes was induced with single dose (50 mg/kg) of streptozotocin (STZ) injection. After 6 weeks from streptozotocin injection (at the end of this time interval, rats were accepted as diabetic), vitamin C was given to diabetic rats daily, for 6 weeks. At the end of this period, the rat testis tissues were dried, grounded and mixed with KBr at a 1:100 ratio. The pellets obtained from the mixture were investigated by FTIR spectroscopy.

Results: A decrease in the area of nucleic acid and protein bands was observed in diabetic testis tissues. There were significant shifts in frequency values of the main protein bands, Amide I and Amide II. Moreover, an increase in bandwidth of Amide I band and the CH_2 stretching bands was detected. An increase in the area of olefinic band was observed. While the area values of the lipid bands in diabetic group decreased, the area values of the lipid bands in ascorbic acid treated group were closer to the results of control group. However, no positive effect of ascorbic acid was observed in spectral parameters in the bands originating from other macromolecules.

Discussion/conclusion: The results of the current study clearly demonstrated that diabetes causes changes in composition and structure of macromolecules. A decrease in RNA and protein synthesis, an increase in the membrane fluidity and an increase in the amount of end-products of lipid peroxidation were observed. There was no restorative effect of ascorbic acid treatment on proteins and nucleic acids. The findings of this study imply that ascorbic acid may exert its treatment effect on diabetes via the lipid metabolism. In addition, results of this study reveal that diabetes causes changes in the secondary structure of proteins.

No conflict of interest

Complications - cardiovascular disease

P-1062

Relation between the index of insulin resistance HOMA-R and the aldosterone/renin ratio in a young adult population

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Introduction: The cardiovascular disease is the greatest cause of mortality in diabetes (DBT) type 2. At the same time, the resistance to insulin is a precocious indicator of DBT risk and it has been indicated as an independent predictor of cardiovascular disease. Therefore, it seems important to know the existing relation between the two great endocrine systems that regulate on the one hand the metabolism of carbohydrates (insulin), the insulin resistance syndrome, and on the other the main hormonal system involved in the control of the cardiovascular apparatus: the renin angiotensin-aldosterone system (RAA). From the work of De Fronzo it is known that the insulin has an antinatriuretic effect with retention of sodium and expansion of volume. The expected answer for this case is a relative inhibition of the RAA system. Nevertheless, recent publications have questionated this theory in essential hypertensive patients and adults with obesity
Objectives: The objective of our research was to determine the existing relation between a validated index of insulin resistance (HOMA-R) and the quotient aldosterone/renin in a young adult population, comparing its value between those with normal weight (BMI<25)and those with overweight or obesity (BMI>25).
Material and methods: 112 young adults of the polimodal cycle of our city were studied. Age X:17.06 years old (16-29 years old), 68 women and 44 men. All of them were in the Tanner V of development. A survey of filiatory´s illnesses and of education level was made. Also, we made a survey of eating habits and a standardized questionnaire about habits of physical activity. We made an anthropometric evaluation (weight, height, BMI and waist circumference) and determined arterial blood pressure (BP) according to protocol of the Task Force. The individuals received a free sodium diet. They were in standing position until 10´previous to the extraction of blood. Conventional analyses were obtained. The insulin was determined by immunoanalysis and the renin and aldosterone by RIE, both by duplicate. The HOMA-R was determined by the conventional formula (glycemia/18x insulin/22.5). Statistical method: test t of student and Mann Whitney, coefficient of correlation of Spearman and Pearson.
Results: The aldosterone/renin index has a positive correlation with systolic BP (r:-0.32,p<0.01), diastolic BP (r:-0.21p<0.04) and the waist circumference (r:-0.20 p<0.04). When the values of HOMA-R in subjects with BMI>25 or <25 were compared we observed a significant difference (HOMA-R X:BMI<25:0.98±0.6 BMI >25:1.67±2.4 p<0.02). When the values of aldosterone/renin ratio were also compared they showed a significant difference in those subjects with BMI<25:Aldo/renin X:41.5±55.2 ng/dl/ng/ml/h,and those with BMI>25:Aldo/renin X:29.6±43.1 ng/dl/ng/ml/h p< 0.02)
Conclusions: In young adult population an increase of the index HOMA-R is observed along with a diminution of the quotient aldosterone/renin when subjects with normal BMI vs those with overweight or obesity are compared.

No conflict of interest

P-1063

Correlation between fasting plasma glucose and autonomic dysfunction in healthy subjects with normoglycemia: an early impairment in cardiovascular adaptation

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Introduction: Autonomic neuropathy associated with the higher risk of cardiovascular mortality. It is known that the autonomic dysfunction appears in the early phases of the disturbances of the carbohydrate metabolism already. The aim of this study was to determine the correlations between autonomic dysfunction and the fasting plasma glucose in healthy subjects with a normal carbohydrate metabolism according to the WHO criteria, normal body weight and blood pressure.
Materials and methods: 14 healthy subjects (age: 45.6±6.86 yrs, fasting plasma glucose: 5.0±0.63 mmol/l [3.9-5.9 mmol/l], HbA1c: 5.3±0.45 %, BMI: 24.0±3.89 kg/m^2, blood pressure: 123/66±14.6/8.6 mm Hg, mean±SD) were included. Autonomic function was investigated by means of the five standard cardiovascular reflex tests, heart rate variability (HRV) and the spontaneous baroreflex sensitivity (BRS). The blood pressure was measured continuously with the Finapres 2300. The ECG signal was detected continuously by means of a Siemens Sirecust 730 ECG. The signals were fed through an analog-digital converter into a computer and analysed off-line. The oscillation amplitude of R-R intervals were analysed as well as the time and frequency domain indexes of HRV. The spontaneous BRS was calculated in the supine position and after standing up and based on the analysis of the spontaneous fluctuations of blood pressure and interbeat intervals. Statistical analysis was performed by SPSS program.
Results: There were statistical significant negative relationships between the fasting plasma glucose and the heart rate response to deep breathing (r=-0.58, p<0.05), the heart rate response to standing up (r=-0.56, p<0.05), standard deviation of all RR intervals (r=-0.59, p<0.05), root mean square of successive RR differences (r=-0.57, p<0.05), power of low frequency component of HRV (r=-0.56, p<0.05), power of high frequency component of HRV (r=-0.57, p<0.05) and the BRS after standing up (r=-0.56, p<0.05). There were no statistical differences between the fasting plasma glucose and the other cardiovascular reflex tests.
Conclusions: Our results suggest the existence of a close relationship between the increase of the normal range for fasting plasma glucose in healthy subjects and the autonomic dysfunction which may forecast the early cardiovascular adaptation damage.

No conflict of interest

P-1064

Decreased plasma concentration of adiponectin in acute phase of myocardial infarction in type 2 diabetes patients with multivessel disease

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Background and aims: Adiponectin is a protein produced in adipose tissue, has potential antiatherogenic properties and takes part in pathogenesis of insulin resistance. It is also decreased in patients with cardiovascular disease and type 2 diabetes. The aim of the study was to assess the potential relationships between plasma adiponectin levels and progression of atherosclerotic changes in coronary arteries in patients with acute coronary syndrome.
Material and methods: Coronary angiography was performed in 43 patients with acute myocardial infarction. The study group comprised 25 patients with type 2 diabetes mellitus (14 men, 11 women, median age 64,6±11,6 years) and 18 non-diabetes subjects (13 men, 5 women, median age 58,8±11 years) - control group. One or two vessel disease was observed in 10 diabetes patients (group I), and three vessels disease was observed in 15 diabetes patients (group II). All patients underwent a medical examination with body mass index (BMI) and Waist/Hip Ratio (WHR). We estimated the level of adiponectin using RIA method.

Results: Three vessels disease was observed more frequently in patients with diabetes mellitus than in control group (60% vs. 16%; p=0,004). Plasma adiponectin level was significant lower in diabetic patients with three vessels disease as compared to the group II (8,3 ± 2,8 vs. 5,9 ± 2,0 µg/ml; p=0.024). There were no significant differences in plasma adiponectin concentration in non-diabetic patients with multivessel and one or two vessels disease (8,6 ± 3,2 vs. 5,3 ± 2,1 µg/ml; p=0,107). The patients with diabetes have lower adiponectin concentration than non-diabetic (6,9±2,6 vs. 8,1±3,3 µg/ml; p=0,2). Adiponectin levels correlated with BMI (r=-0.35; p<0.05) and WHR (r=-0.32; p<0.05).

Conclusions: Plasma adioponectin levels in diabetic patients with acute myocardial infarction correlated significantly with progression of atherosclerotic changes in coronary arteries. This may suggest that decreased plasma adiponectin concentration is associated with a higher risk of multivessel disease.

No conflict of interest

P-1065

High osteoprotegerin levels in newly diagnosed type 2 diabetic males and correlations with glucose parameters

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Osteoprotegerin (OPG) was initially discovered as an inhibitor of bone resorbtion, but recently increased OPG levels were found in diabetics and in patients with coronary artery disease (CAD) too. Up to date there are insufficient data on OPG concentrations in newly diagnosed type 2 diabetic patients. The aim of our study was to determine serum OPG in males with newly diagnosed T2DM associated or not with concomitant CAD as well as in males with known T2DM.

Serum OPG levels were measured in 36 type 2 diabetic males (mean age 56.9 ± 1.5 years), including 17 newly diagnosed subjects without history of CAD (group 1) and 17 diabetic patients who underwent percutaneous coronary interventions (PCI) for a clinical manifestation of CAD, the latter consisting of 9 newly diagnosed diabetics (group 2) and 8 patients with known T2DM, with mean duration of diabetes of 10.9 ±3 years (group 3). All newly diagnosed glucose abnormalities were detected during 2 screening programs among risk groups. Glucose tolerance was defined by performing a standard OGTT. The control age- and BMI-matched group (n=20) had normal glucose tolerance. OPG was measured by ELISA (BioMedica).

OPG was significantly higher in all type 2 diabetics (3.8±0.2 vs 2.7 ± 0.2 pmol/l, p=0.0002) and especially in all newly diagnosed diabetics (3.9±0.2 vs 2.7 ±0.2 pmol/l, p=0.0004). There was no significant difference between newly diagnosed diabetic males with performed PCI (group 2) or those without known CAD (group 1)- 3.4 ± 0.2 vs 4.1 ± 0.3 pmol/l, p=0.14 respectively. Males with known diabetes and performed PCI (group 3) were with higher OPG compared to controls (3.6 ± 0.2 vs 2.7 ± 0.2pmol/l, p=0.02), but there were not significant differences with other newly diagnosed diabetic patients (3.6 ± 0.2 vs 4.1 ± 0.3 pmol/l, p=0.2; 3.6 ± 0.2 vs 3.4 ± 0.2 pmol/l, p=0.7 for group 1 and 2 resp.). We found positive correlation of OPG concentrations with fasting plasma glucose (r=0.27, p=0.04), 120 min post-OGTT glucose (r=0.32, p=0.02) and HbA1c (r=0.31, p=0.03).From lipid parameters OPG correlated positively only with HDL-cholesterol (r=0.3393, p=0.02).

We found higher serum OPG levels in newly diagnosed type 2 diabetic males independently of presence of CAD, and no difference compared to males with long-lasting diabetes. The positive correlations of OPG with glucose parameters may explain the higher concentrations in diabetics and we speculate that OPG rises early in the evolution of diabetic disorders but further investigations are needed.

No conflict of interest

P-1066

Low intensity physical activity improves left heart brachial aortic pulse wave velocity in elderly hemiplegics with type 2 diabetes mellitus: a randomized control trial

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The aim of this study was to investigate the effect of low-intensity physical activities (LIPAs) on left heart-brachial aortic pulse wave velocity in elderly hemiplegics.

LhbPWV has high correlation with sudden death in T2DM people.

The method of study, the design of study was a randomized control trial.

The participants were 25 elderly hemiplegics (mean age ±SD=73 ± 8 years) with independent ADL, living in private residences and utilizing a nursing home. We got informed consent of them.

The length of time elapsed from the occurrence of the stroke was greater than 5 years, and they required a walking aid (e.g., a cane) outdoors. Twenty-two participants (88%) also used a walking aid indoors.

The subjects' main co-existing medical conditions included hypertension (92%) and diabetes mellitus (80%).

The intervention was to increase the energy consumption from baseline physical activity (PA) through LIPAs (approximately 40 kcal/day; 3.3% of daily calories). LIPAs involved all limbs and body movement such that the body's centre of gravity moved up and down while in a standing position (interventional group [IG]; n=13).

The movement gave a passive motion to the affected arm and leg.

In the control group (CG; n=12), only the baseline PA was measured.

Outcomes were evaluated by the left heart-brachial aortic pulse wave velocity (lhbPWV), body weight, body mass index, resting systolic blood pressure, calculated PA from daily activities, and the ankle-brachial pressure index.

The data analyzed of the independent t-test on the outcomes to compare the differences between the CG and the IG at baseline (1st week) and after 4 and 8 weeks of intervention.

In the results, the lhbPWV values in the affected arm were significantly difference in the IG compared with the CG (pre 1172cm/s vs.1162cm/s, post 1201cm/s vs. 1332cm/scm/s; P < 0.05) eight weeks after the initiation of the trial.

These activities resulted in significant improvement to deterioration in their aortic stiffness, as reflected by a change in the lhbPWV.

No conflict of interest

P-1067

Cardiovascular risk factors in type 2 diabetic patients: a cross sectional study, Iran

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Aim: The aim of the study was to evaluate cardiovascular risk factors and assess coronary heart disease (CHD) risk at 10 years according to Framingham point scores. Moreover the possible relation of other CHD risk factors, which were not considered in Framingham equation, was evaluated.

Methods: We assess the CHD risks in type 2 diabetic patients referred to university hospital diabetes clinic from October 2007 to July 2008 in Qom, Iran. Based on probability of CHD events in 10 years, patients were classified in three groups :< 10%, 10-20% and >20% according to NCEP/ATPIII Framingham risk score. We also evaluate the relationship between other CHD risk factors not included in Framingham equation such as BMI, Waist circumference, LDL cholesterol, TG and Diastolic blood pressure (DBP). Lipid profiles and hypertension were defined according to ATP III and JNC VII criteria respectively.

Results: A total 360 patients (50% males) with mean age 53.9± 10 years were evaluated. 80.3% had BMI>25, 37.2% of females and 10% of males had waist circumference>88 and >102 cm respectively.

LDL-cholesterol>100 and TG>150mg/dl were seen in 78.8% and 73.6% respectively. According to JNC VII criteria, 40% had prehypertension state and 45.3% were hypertensive. Family history for CHD was positive in 34%. HbA1C>7%was seen in 91.3%.Total score according to Framingham equation was 14.9±4.4 in males and 11.4±3.7 in females.70.6% of males and 11.6% of females had probability of CHD in 10 years>10%. Correlation between DBP and LDL cholesterol with CHD risk in women and men was statistically significant. In men TG levels had linear correlation with CHD risk (P=0.02).

Conclusions: Most diabetic patients did not have adequate control of cardiovascular risk factors, and for assessing CHD risk in diabetic patients other risk factors, not included in Framingham score, such as LDL-C, DBP and TG, should be considered important.

No conflict of interest

P-1068

Spontaneous platelet macro-aggregation (SPMA) and high clopidogrel maintenance dose in patients with diabetes mellitus and coronary artery disease

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Aims: Platelets in diabetic patients show exaggerated aggregation, both spontaneous and in response to stimulating agents, even after treatment with aspirin and clopidogrel. Whether inhibition of platelet aggregation can be enhanced by increasing clopidogrel maintenance dosage in diabetes patients with Spontaneous platelet macroaggregation (SPMA) is unknown. The aim of this study was to assess the impact of a high maintenance dose in diabetes patients with SPMA.

Methods: Diabetic patients with acute coronary syndrome (ACS) who were on dual antiplatelet therapy with aspirin (150mg/day) and clopidogrel (75mg/day) for at least 7 days, were screened to identify the SPMA cases. Spontaneous platelet aggregation was studied in an aggregometer cuvette without agonist while the stirring rate was fixed at 1000 rpm/min. SPMA cases were randomized to 15-days treatment with a standard (75 mg; n=8) or high (150 mg; n=8) daily maintenance dose of clopidogrel. Platelet aggregation with agonist (collagen, ADP and epinephrine) was assessed before and after dose doubling.

Results: A total of 107 diabetic ACS patients were screened to identify 16 SPMA cases. Aggregation profiles of SPMA cases were unique and different from non-SPMA cases. All SPMA cases showed higher aggregation with agonists even after 7 days of therapy. After randomization, ADP induced (10 µM/L) platelet aggregation was significantly reduced in the 150-mg group compared with the 75-mg group. After 15 days therapy SPMA disappeared in 5 patients on 150 mg clopidogrel and only 2 patients in 75 mg clopidogrel. The response to even 150mg clopidogrel was suboptimal in 40% cases.

Conclusions: SPMA cases are related to high platelet reactivity. The antiplatelet effect of 150mg maintenance dose of clopidogrel is much better as compared to 75mg maintenance dose in diabetic ACS patients with SPMA. Large scale clinical trials are needed to further study the response.

No conflict of interest

P-1069

Association of cardiac autonomic neuropathy and right bundle branch block in type 2 diabetic patients

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Aim: Recent research indicates that cardiac conduction defects are associated with increased risk of mortality of cardiovascular diseases. Right bundle branch block (RBBB) is more common in older age, male, hypertension and diabetes. The cause of increased prevalence of RBBB in diabetic patients is not known. The aim of this study is to evaluate the relationship of RBBB and diabetic autonomic neuropathy.

Objects and methods: Among 1064 type 2 diabetic in-patients between January and December in 2004, 363 type 2 diabetic patients under 80 years old, without chronic renal failure, without ischemic heart disease, and not taking drugs related to autonomic nerve function, were examined by electrocardiogram. RBBB was determined according to the Minnesota code; rSR' or rR' in lead V1, and wide S wave in lead V5 and V6. Fifteen patients (men 11,age 65±9 years old) had RBBB in electrocardiogram (ECG) (RBBB group). Age and sex matched 30 patients (men 22,age 65±9 years old) with normal ECG were recruited as normal control (C group), then we performed case-control study. Cardiac autonomic neuropathy was assessed by the change in heart rate resulting from taking a deep breath (R-R). R-R was examined after 10 minutes rest, and R-R interval measured every 6 deep breath in 1 minute. Results were expressed as heart rate differences (max-min), and heart rate difference more than 15 beats were defined normal. Blood pressure, HbA1c, serum lipid, and presence of diabetic retinopathy were compared between RBBB group and C group.

Results: The average R-R was 7.4±3.3 beats/min in RBBB group. No one had normal R-R in RBBB group. In C group, 32% of patients had normal R-R, and the average of R-R was 11.5±7.3 beats/min. R-R was significantly decreased in RBBB group as compared with C group ($p<0.05$). While HbA1c (9.1±1.5% vs 8.6±1.5%, RBBB vs C group), duration of diabetes (20±9 vs 21±8 years), systolic blood pressure (131±19 vs 123±17 mmHg), diastolic blood pressure (72±6 vs 71±9 mmHg), LDL cholesterol (113±26 vs 112±27 mg/dl), HDL cholesterol (48±11 vs 49±14 mg/dl), triglyceride (154±130 vs 125±76 mg/dl), and presence of diabetic retinopathy (67 vs 67 %) were not significant differences between two groups. In multiple regression analysis, presence of RBBB was an independent risk factor for decreased R-R ($p<0.05$) adjusted by HbA1c, blood pressure, serum lipid, presence of diabetic retinopathy.

Conclusions: Our study shows that type 2 diabetic patients with RBBB decreases the change in heart rate resulting from taking a deep breath as compared to patients with normal ECG. It suggests diabetic autonomic neuropathy may play a role of cause for RBBB in type 2 diabetic patients.

No conflict of interest

P-1070

Cardiovascular disease risk factors in individuals with a family history of type 2 diabetes mellitus

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To determine the prevalence cardiovascular disease (CVD) risk factors in individuals with a family history of type 2 diabetes, 346 subjects residing in Bushenyi and Kasese districts of Uganda were enrolled into the study between April and December 2006. Of these, 114 (41 men; 73 women), mean age 49 years, mean BMI 23.9 kg/m^2, had a family history of type 2 diabetes (FHD group); 112 (45 men; 67 women), mean age 54 years, mean BMI 23.1 kg/m^2, were subjects with no family history of diabetes (Control group), and 120 (53 men; 67 women), mean age 55 years, mean BMI 24.7 kg/m^2, were patients with type 2 diabetes (Diabetics group).

Data was collected on history of smoking, consumption of alcohol, fruit and vegetables, and physical activity. Weight, height, waist circumference, blood pressure and fasting plasma glucose and lipids were measured after an overnight fast.

A one-way between groups analysis of variance was conducted to explore differences in high density cholesterol (HDL-C), low density cholesterol (LDL-C), total cholesterol (Total-C) and triglycerides (TG) in FHD group, Controls and Diabetics. No significant differences were observed. The mean ± SD mmol/l HDL-C was 0.8 ± 0.31; 0.9 ± 026 and 0.8 ± 0.31 for FHD, Controls and Diabetic groups: [$F(2, 325) = 2.4$, $p = 0.90$]. The mean ± SD mmol/l LDL-C was 2.2 ± 0.67; 2.1 ± 0.61 and 2.2 ± 0.59 for FHD, Controls and Diabetic groups: [$F(2, 236) = 1.0$, $p = 0.36$]. The mean ± SD Total-C was 3.5 ± 1.01; 3.5 ± 0.86 and 3.6 ± 0.86 for FHD, Controls and Diabetic groups: [$F(2, 326) = 0.84$, $p = 0.43$]. The mean ± SD mmol/l TG was 1.8 ± 1.21; 1.6 ± 0.87 and 1.9 ± 1.11 for FHD, Controls and Diabetic groups: [$F(2, 327) = 2.6$, $p = 0.07$].

The prevalence (95% CI) of undiagnosed diabetes in FHD group was 7% (2.7 – 13.3%) and 2.7% (-0.3 – 6.1%) in controls. The prevalence of undiagnosed hypertension was 31.2% (16.7 – 33.7%) in the FHD group and 34.5% (22.8 – 40.6%) in controls. The prevalence of hypertension was 43.1% (34.2 – 52.0%) in diabetics. The prevalence of 'taking fruit and vegetables rarely' was 41% (31.4 – 50.6); 44% (32.8 – 51.8%) and 39% (24.1 – 40.9%) in the FHD group, controls and diabetics respectively. The prevalence of physical inactivity (sedentary lifestyle) was 29% (20.1 – 37.9%); 47.1% (37.5 – 56.7%) and 43.3% (34.4 – 52.2%) in the FHD group, controls and diabetics respectively. The prevalence of severe forms of obesity was low, as was the prevalence of smoking.

The results indicate a prevalence of 7% of undiagnosed diabetes in subjects with a family history of diabetes compared to 2.7% in those without, and an associated high prevalence of undiagnosed hypertension of 31%.

No conflict of interest

P-1071

Agreement and correlation of cardiovascular risk measure in patients with diabetes type 2 through Framingham, UKPDS V 2.0 and WHO (AMRD) 2008 scales.

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Cardiovascular risk assessment allows adequate management of diabetic type 2 patients (DM2). Agreement between risk scales has been controversial. We examined the agreement in risk definition and the correlation in the cardiovascular risk measure between Framingham, UKPDS V 2.0 and WHO (AMRD) 2008 chart.

All 148 DM2 patients from Otavalo, Ecuador were submitted to cardiovascular risk assessment applying Framingham, UKPDS v2 and the WHO chart. A multivariate analysis was done

Average age was 61.4 ± 10.4 years. Time of disease was 8.5 years (1-32 years). Risk probabilities were correlated between Framingham and UKPDS for non-fatal coronary (r=0.78), fatal coronary (r=0.72) and non fatal stroke risks (r=0.67). Comparing WHO with Framingham, contingency coefficient was of 0.675. Correlating Framingham with the UKPDS, contingency coefficient was of 0.595, 0.553 and 0.572 for non-fatal, fatal coronary and non fatal stroke risks respectively. Analysis by age (<65 years and >= 65 years) and time of disease (<10 years and >=10 years), showed lower correlation and contingency coefficients than those of the general sample except for people over 65 years old. The correlation coefficient between Framingham and UKPDS for non fatal and fatal coronary risks were higher than 0.7 in the multivariate analysis of age and time of the disease.

There is a good correlation between fatal and non fatal coronary risk assessment (UKPDS) compared to the Framingham, as well as a good agreement for the definition of low risk, especially in people older than 65 years and with more than 10 years of disease.

No conflict of interest

P-1072

Association between hyperglycaemia and subclinical coronary atherosclerosis in patients with diabetes mellitus

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An observational and transversal study was carried out in 42 patients without symptoms of ischemic heart disease with the objective of identifying whether there was a relationship between hyperglycaemia and coronary atherosclerosis. The presence of atherosclerosis was determined by measuring the calcium score and studying the morphology of the coronary territory, by means of a multislice computerized axial tomography, related to the glycaemia control. Other coexistent risk factors were analyzed as well: hypertension, nicotinism, obesity and dyslipidaemia.

Patients with hyperglycaemia (fasting and post prandial) showed a significant association (p= 0.024) with coronary damage. This relationship was more evident with postprandial hyperglycaemia (p=0.016). The presence of hyperglycaemia represented a significant increase (5.9 times) with the relative risk of identifying coronary atherosclerosis (p = 0.045). However, it was not confirmed with other conventional risk factors.

We conclude that the lack of glycaemia control (glycaemia disorders) was positively related with the coronary damage detected by a multislice computerized axial tomography among the diabetic patients studied, who showed no clinic manifestation of ischemic cardiopathy

No conflict of interest

P-1073

Prevalence of coronary artery disease in type 2 diabetes among hospitalised patients

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Aim: In India both Diabetes and Cardiovascular disease occur in epidemic proportions.The present prevalence of diabetes in India ranges from 9-14%.It is estimated that type 2 diabetics have a 2-4 fold higher risk for cardiovascular disease than non diabetics. We aim to assess the prevalence of Cardiovascular disease among hospitalised diabetic patients in Chennai, Southern India.

Materials and methods: We studied patients admitted between Jan 2007 and Jan 2008 in a community hospital in an industrial area of Chennai, a city in Southern India. A total of 4997 were included in the study. Among these patients the total number of diabetics (both known diabetics and newly detected diabetics using standard diagnostic criteria) were estimated. Among these diabetics, the incidence of coronary artery disease (acute coronary disease and ischaemic heart disease) were assessed using standard protocols.

Results of the study: Out of the 4997 hospitalised patients 634 (12%) had diabetes. Out of these 634 diabetics 172 (27%) had coronary artery disease of which 100 (58%) were male patients and 72 (42%) were female patients. Out of 172 patients who had cardiovascular disease 70 (40.69%) patients had Acute Coronary Syndrome and the remaining 63.3% had Ischaemic Heart Disease. Out of the 172 patients diagnosed to have Coronary Artery Disease 27 (15.69%) had no symptoms referable to Cardiovascular System.

Conclusion: Prevalence of Diabetes Mellitus in hospitalised patients is equal to the Indian average. But the incidence of Coronary Artery Disease (Ischaemic Heart Disease and Acute Coronary Syndrome) among these diabetic patients is alarmingly higher than the previous Indian Study Research. Among these patients with Coronary Artery Disease, 15.69% presented with features not referable to Cardiovascular System. This new observation from this study calls for thorough screening for Cardiovascular Disease among hospitalised Diabetic patients whether symptomatic or not, as Diabetes Mellitus is considered to be a Coronary equivalent.

No conflict of interest

P-1074

Role of intracellular zinc on phosphorylation level of cardiac ryanodine receptors in normoglycemic and hyperglycemic rats

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Abnormal intracellular Ca^{2+} ($[Ca^{2+}]_i$) handling by the sarcoplasmic reticulum (SR) is a critical factor in the development of heart dysfunction. Excitation-contraction coupling is predominantly controlled by Ca^{2+} release from the SR via the ryanodine receptors (RyR2). Hyperphosphorylation of RyR2 induces Ca^{2+} leak during diastole, which can cause fatal arrhythmias and lead to heart dysfunction in diabetes. Several Ca^{2+} binding proteins in cardiomyocytes bind Zn^{2+} suggesting that Zn^{2+} can modulate the structure and function of many proteins such as SR, which play important role in excitation-contraction coupling. It was also demonstrated that Ca^{2+} dependence of RyR2 binding to the SR of cardiomyocytes is greatly affected by Zn^{2+}. Since free Zn^{2+} is altering function of numerous cellular proteins, its mobilization by ROS in diabetic heart can be likely to cause significant effects. It is highly likely that any mechanism that alters the concentration and distribution of intracellular free Zn^{2+} ($[Zn^{2+}]_i$) in cardiomyocytes will cause profound functional effects. Previously we clearly established that the defects in intracellular Ca^{2+} –related mechanisms could be attributed to anomalous RyR2 behavior such as reduced amount of RyR2 and FKBP12.6 levels and the PKA-dependent phosphorylation of RyR2. In this study, we aimed to examine role of intracellular zinc on the phosphorylation level of RyR2. We used pulverized hearts from normal and streptozotocin-induced diabetic rats and exposed them to different concentrations of either ZnCl2 or Zn-pryt. We measured total protein level of RyR2 and phosphorylated level of RyR2 (P-RyR2). Firstly, we observed that P-RyR2 level was significantly higher than that of the control. Second, the P-RyR2 level of both normal and diabetic hearts increased significantly with increasing zinc concentration, whereas the increase was more pronounced in normal heart compared to the diabetics. It is, therefore, concluded that a detailed understanding of the basic structure and function of RyR2 and relationship with intracellular zinc levels will provide us their involvement in heart diseases, and the development of drugs to prevent RyR2 malfunction and recent patents.

Conflict of interest:
Other substantive relationships: Supported by TUBITAK SBAG-107S427&SBAG-107S304

P-1075

Role of antioxidant treatment on diabetes-induced altered actors of MAPK pathway of the heart

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Oxidative stress contributes to the development of a wide range of diseases including diabetes and results from an imbalance between the production of reactive oxygen and the system's ability to readily detoxify the reactive intermediates repair the resulting damage. Cells are normally able to defend themselves against the oxidative stress induced damage by regulating the cellular redox status through the antioxidant systems. The present study was performed to examine the effects of antioxidant treatment (sodium selenate; 15 µmol/kg/day for 4 weeks) on the actors of MAPK pathway such as ERK and NF-kappaB in diabetic rats. We measured total and phosphorylated ERK and NF-kappaB levels in the heart tissue by using Western Blot technique. Total and Phospho - ERK levels were increased about 40% compared to those of the controls. We also observed 30% decrease in the level of total NF-kappaB while 85% increase in the level of Phospho - NF-kappaB. Sodium selenate treatment of the diabetic rats preserved these altered levels of MAPK actors, significantly. For comparison, we also treated the diabetic rats with another antioxidant, omega - 3E for the same period and obtained the similar beneficial effects on these parameters. In conclusion, the results of the present study show that diabetes induced a significant increase in the levels of oxidative stress and/or caused a defect into antioxidant defence system. Furthermore, our data demonstrated that antioxidant supplementation might be beneficial for diabetes therapy due to an improvement of antioxidant defence system against diabetes induced altered cell defence state.

Conflict of interest:

Other substantive relationships: Supported by TUBITAK SBAG-107S427&SBAG-107S304

P-1076

Beneficial effects with beta-adrenergic receptor blockers on diabetes-induced intracellular Ca2+ related mechanisms in the heart

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Beta adrenergic receptor blockers play an important role in the management of the cardiovascular diseases. Chronic beta adrenergic receptor (ß-AR) blockade improves cardiac contractility and prolongs survival of the patients with heart failure. An important disease of the modern life, Diabetes Mellitus is associated with cardiovascular diseases. Defective mechanical activity of the heart in type 1 diabetic animals includes alteration of Ca^{2+} signaling via changes in critical processes that regulate intracellular Ca^{2+} concentration.

Methods: Since propranolol and timolol are nonselective agents with different ß1- potency, we previously examined the long-term beneficial effects of non-selective ß-AR blockers, propranolol (25 mg/kg/day) - or timolol (5 mg/kg/day) administrations (intragastrically, 3 months) on the depressed mechanical activity of the heart.

Aim: Therefore, in this study we aimed to examine the effects of these agents on L-type Ca^{2+} currents (I_{Ca}) and electrically stimulated intracellular Ca^{2+} transients of freshly isolated cardiomyocytes from diabetic rats.

Results: Diabetes induced a significant increase in cell size without any significant effects on the I_{Ca} density, a significant increase in basal free Ca^{2+} concentration, and marked decrease in amplitude of the Ca^{2+} transients. In addition, the caffeine induced Ca^{2+} transients was %30 smaller than that of the controls. Both beta-blockers preserved these altered parameters of intracellular Ca^{2+} related mechanisms in diabetic cardiomyocytes, significantly. These beneficial effects obtained with both beta-blockers were not in the same order; mostly their effects were differential except their effects on the cell size. In addition, we observed that these beneficial effects with these two beta-blockers were not only related with their direct effect on their receptors but also related with intracellular secondary signaling pathways such as adenyl cyclase.

Discussion/conclusion: As summary, although prevention of diabetes-induced altered cardiac function by beta-blockers might present a useful pharmacological strategy for the treatment of diabetic cardiomyopathy, it can be clearly concluded that there are differences in the effect of individual beta-adrenergic blocking agent.

Conflict of interest:

Other substantive relationships: Supported by TUBITAK-SBAG-107S427 and TUBITAK-COST-107S304

P-1077

Prevalence of accompanying pathology in patients with type 2 diabetes mellitus by results of autopsies

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Aims: To evaluate prevalence of accompanying pathology, its contribution to causes of death in patients with type 2 diabetes mellitus (type2 DM) according to medical histories and pathologic diagnoses.

Methods: 1927 patients died in Moscow's City clinical hospital N50 during 2006-2007 years, 289 of them had hyperglycemia. Only 188 patients (65.05%) had established type 2 DM. In these subjects the main causes of death, prevalence of accompanying pathology, and equivalence of clinical and pathologic diagnoses were studied at the base of case reports and results of autopsies.

Results: Among the 188 patients with type 2 DM there were 136 women (72.34%) at the age of 76 [69; 80.25] years and 52 men (27.66%) at the age of 76 [71.75; 81] years. Cardiovascular diseases were reported in 177 subjects (94.14%): an acute/recurrent myocardial infarction (MI) in 40 patients (21.27%) and postinfarction/atherosclerotic cardiosclerosis in 143 patients (76.06%). Cerebrovascular disease (ischemic and hemorrhagic strokes/postinsult state) was detected in 86 cases (45.74%). 85 patients (45.2%) had a combination of cerebrovascular and cardiovascular pathology. Diseases of respiratory system (chronic obstructive/mucopurulent bronchitis, bronchial asthma) and malignant tumors were revealed in 56 (29.78%) and 31 patients (16.48%), respectively. Pyelonephritis and inflammatory diseases of urinary tract were detected in 20 cases (10.63%). The main causes of death of 188 subjects were ischemic/hemorrhagic strokes (27.65%), postinfarction cardiosclerosis (23.93%), acute/recurrent MI (21.27%), malignant tumors (13,83%). All the cases were mainly complicated by renal impairment - actually every second patient from 188 had renal failure (53.72%). Pyelonephritis was the immediate cause of death certified by autopsy only in 10 of 20 patients, however renal failure was detected in 18 subjects (90%). Combination of several nosological forms (2-5) in one patient was revealed in 166 cases (88.3%), 56 of 188 fatal outcomes (29.78%) were resulted from 2 competitive diseases. Divergences of clinical and pathologic diagnoses were registered in 52 of 188 (27.65%) cases and in 15 cases (28.95%) they were clinically significant.

Conclusions: Along with considerable prevalence of cardiovascular and cerebro-vascular diseases, high rate of infectious pathology of urinary tract was detected, its potential contribution in renal failure was confirmed. Substantial prevalence of pyelonephritis leading to death demands more active identification and correction. High frequency of combination of several diseases in one subject should determine more careful examination and treatment of patients according to the accompanying pathology. Ascertained rate of divergences of clinical and pathologic diagnoses underlines great value of autopsy for retrospective analysis of severe medical cases, for assessment of quality of treatment.

No conflict of interest

P-1078

Evaluation of adiponectin and leptin levels in acute myocardial infarction and period of convalescence in patients with type 2 diabetes mellitus

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Aims: The aim of the study was to evaluate adiponectin and leptin concentrations in acute myocardial infarction and period of convalescence in patients with type 2 diabetes mellitus.
Material and methods: Coronary angiography was performed in 58 patients with acute myocardial infarction (within 12 hours from symptoms onset). The study group comprised 35 patients with type 2 diabetes mellitus (25 men, 10 women, mean age 64,6±11,2 years) and 23 non-diabetic subjects (17 men, 6 women, mean age 59,6±10 years) - control group. All patients underwent medical examination and body mass index (BMI) and Waist/Hip Ratio (WHR) were calculated. Venous blood was collected after 24 hours of admission (second day), on day 5 and three weeks after admission.
Results: Patients with diabetes had lower adiponectin concentration than non-diabetics (in acute phase 6,33±2,55 µg/ml vs. 6,81±2,71 µg/ml p=0,4; in period of convalescence 6,31±2,68 vs. 7,97±3,56 µg/ml p=0,04). Adiponectin levels correlated negatively with waist circumference (r=-0,47; p=0,004). Plasma adiponectin levels in non-diabetic patients declined significantly on days 2 and 5 compared to the concentrations on day 21 (p<0,05). Adiponectin level was significantly associated with BMI, arterial blood pressure, glucose and insulin blood levels. These independent variables explained 32% of the plasma adiponectin variability.
Mean levels of leptin was significantly lower in non-diabetics compared to diabetic patients. Plasma leptin level in diabetic patients was significantly higher in acute myocardial infarction than in period of convalescence (18,3±14,33 µg/ml, 16,17±12,88 µg/ml, 14,84±11,22 µg/ml, X^2 ANOVA=7,1 p=0,02). Leptin level was significantly associated with BMI, waist circumference, proinsulin/C-peptide (marker of ß-cells dysfunction) and HOMA-IR index, and these independent variables explained 69% of the plasma leptin variability.
Conclusions: Plasma leptin levels in diabetic patients were significantly higher in acute myocardial infarction than in period of convalescence. Plasma adiponectin levels in non-diabetic patients with acute myocardial infarction declined significantly on days 2 and 5 compared to the concentrations on day 21.

No conflict of interest

P-1079

Serum 25-hydoxyvitamin D levels are associated with arterial stiffness in type 2 diabetes

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Aims: Many tissues including vascular smooth muscle, endothelium, and cardiomyocyte express the vitamin D receptor. 25-hydoxyvitamin D (25-OH D) has been found to play an important role in prevention of cancers, auto-immune disease, cardiovascular disease, diabetes, and infections. Viatmin D deficiency seems to predispose to cardiovascular disease. But clinical data to support these results are lacking.
Methods: We studied 60 type 2 diabetic patients over age 30 (mean age 58 years; 55% women) without prior cardiovascular disease. Vitamin D status was assessed by measuring 25-OH D levels. Pulse wave velocity measured by the Vascular Profiler 1000 (VP-1000) wave form analysis.
Results: Their mean duration of diabetes was 9 ± 3.8 years and mean A1c was 10.4 ± 2.1%.
46% of individuals had 25-OH D levels <20 ng/mL, and 10% had levels <10ng/mL. Mean pulse wave velocity was 1803.0 ± 412.6 cm/sec. Serum 25-OH D level was significantly reduced in increased PWV group.
Conclusion: Serum 25-hydroxyvitamin D levels are associated with arterial stiffness in type 2 diabetes.
Type 2 diabetic patients in vitamin D insufficiency or deficiency need to monitor cardiovascular disease and should consider vitamin D supplement.

No conflict of interest

P-1080

Correlations between left ventricular wall thickness and short-term beat-to-beat QT variability in patients with type 1 diabetes mellitus

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Background and aim: Determination of short-term QT-interval variability (QTV) is an intensively investigated new and non-invasive method for assessment of proarrhythmic risk. Several studies have demonstrated that temporal QTV is a more sensitive predictor of ventricular arrhythmias than conventional QT-measurement parameters. Enhanced QTV has been observed in patients with diabetes mellitus (DM). Furthermore, elevated QTV has also been found in an experimental model of left ventricular hypertrophy in normoglycemic dogs. The aim of the present study was to evaluate the possible connections between the QTV, the left ventricular wall thickness and the autonomic function in patients with type 1 diabetes mellitus.
Subjects and methods: 38 DM patients (age: 31.9±1.7 years, male/female ratio: 19/19, duration of DM: 14.0±1.9 years, HbA1c: 8.2±0.2%, BMI: 24.5±0.6 kg/m^2, blood pressure: 127/76±2.6/2.0 mm Hg; mean±SEM) were enrolled into the study. ECGs were recorded continuously for 5 min and all leads acquired by an ECG signal processing system. After analogue-to-digital conversion, the data were stored on hard disk and analyzed off-line using SPEL Advanced Haemosys software (v3.0). The RR and QT intervals were measured as the average of 31 consecutive beats (RR: 812±24.5 ms, QT: 387±5.6 ms, QT_c: 432±4.2 ms). To characterize the temporal instability of beat-to-beat repolarization, Poincare' plots of the QT intervals were constructed, where each QT value was plotted against its former value. QTV was calculated using the following formula: QTV= ?$|QT_{n+1}-QT_n|$/ (30xv2). Left ventricular dimensions and function were measured by transthoracic echocardiography. Autonomic function was assessed by means of five standard cardiovascular reflex tests.
Results: In DM patients, the QTV (4.3±0.2 ms) exhibited positive correlation with the thickness of the posterior wall ($r = 0.47$, $p < 0.001$) and the interventricular septum ($r = 0.37$, $p < 0.001$) of the left ventricle. There were no significant correlations betweeen the QTV values and the parameters of the autonomic tests.
Conclusion: Our data suggest a close relationship between the left ventricular thickness and the short-term QTV in patients with DM. This relationship suggests a possible additive role of cardiac hypertrophy in the etiology of increased instability of cardiac repolarization in DM population.

No conflict of interest

P-1081

Plasma ascorbic acid levels and angiopathic complications in Portuguese type 2 diabetic patients

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Background: Diabetes is now one of the most common non-communicable diseases globally. Non-insulin-dependent diabetes mellitus (type 2) is the most prevalent form of the disease in Portugal. A recent prevalence study of diabetes in Portugal performed by the Portuguese Diabetes Association (APDP) indicated that approximately 1 million of Portuguese suffer from this disease. Type 2 diabetes has been associated with oxidative stress and it is considered an important risk factor for cardiovascular disease. Epidemiological studies have shown that an increased intake of free radicals and decline of antioxidant concentrations were related to low antioxidant function in type 2 diabetes. Ascorbic acid (vitamin C) is an important dietary derived antioxidant and usually its blood levels are evaluated in oxidative stress status. However, it is unclear whether plasma ascorbic acid levels are different in type 2 diabetic patients with and without the presence of macro- or microangiopathic complications.
Aim: To compare ascorbic acid levels in Portuguese type 2 diabetic patients with and without angiopathic complications.

Methods: Plasma ascorbic acid was measured in 120 type 2 diabetic patients (40-75 years) from APDP using a validated UPLC method. Group I: 60 patients (25 males and 35 females) with macro- or microangiopathy and group II: 60 patients (21 males and 39 females) without angiopathy. The inclusion criteria for group I were: presence of at least one of the following complications – personal history of angina pectoris, coronary artery disease, peripheral vascular disease or retinopathy and for group II: absence of any macroangiopathy and retinopathy. A statistical analysis was performed to test differences in plasma ascorbic acid levels between the studied groups.
Results: Ascorbic acid levels in Portuguese type 2 diabetics with cardiovascular complications or retinopathy were significantly ($p<0.05$) lower (20.92 ± 7.77 µmol/l) than diabetics without complications (24.16 ± 8.06 µmol/l).
Conclusion: The results showed statistically significant differences between the groups in plasma ascorbic acid levels. Cardiovascular complications and retinopathy in type 2 diabetes are inversely related to vitamin C plasma levels.

No conflict of interest

P-1082

Cross-sectional survey of aspirin use and dose in Albertans with diabetes

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Aim: Antiplatelet therapy, primarily with 80 to 325 mg aspirin daily, is recommended for cardiovascular (CV) risk reduction in diabetes. Emerging evidence suggests, however, that people with diabetes may have resistance to aspirin and require doses in excess of 160 mg daily to effectively lower the risk of CV disease. Although several population-based surveys suggest that about 40% of people with diabetes use aspirin regularly, the daily dose used remains unknown. This study measured (1) the proportion of people in Alberta, Canada, with diabetes who currently use aspirin regularly for CV risk reduction; and (2) the most common aspirin dose used.
Methods: Pharmacy students in their 4th year of undergraduate training are required to complete 16 weeks of experiential learning in various practice settings. During their community pharmacy rotations, these students have an opportunity to collect information on aspirin use from Alberta residents living with diabetes. Students were responsible for obtaining informed consent from the participants, completing a short survey to identify CV risk factors and aspirin use, and faxing information to the data collection centre. Data were examined using descriptive statistics.
Results: This analysis is based on 117 surveys returned during the first term and half of the second term of this project. The mean age of participants was 62 (± 13) years, 62 (53%) were women, and 97 (83%) had type 2 diabetes. Aspirin was used regularly by 72 (61%) participants. Of these, 61 (85%) were using 81 mg daily, 8 (11%) were using 325 mg daily, and 3 (4%) did not report their daily dose. Of the 45 individuals not using aspirin regularly, 5 (11%) people reported a previous vascular event (3 were using other antiplatelet agents) and 35 (78%) had one or more risk factors for cardiovascular disease. The remaining 5 (11%) individuals not using aspirin regularly did not have any cardiovascular risk factors.
Discussion: It appears that aspirin use in Alberta residents with diabetes is higher than previous reports. The most common aspirin dosage used is 81 mg, which may not be optimal for effective CV risk reduction. In addition to the examination of aspirin use, this project introduced pharmacy students to practice-based research activities. It is our hope that these activities will encourage them to participate in future studies.

No conflict of interest

P-1083

Risk factors for coronary artery disease in the population of the municipality of Maracaibo, Zulia State

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Introduction: Cardiovascular diseases are the leading cause of morbidity and mortality in most westernized countries. The aim of this study was to identify major risk factors for coronary artery disease in Maracaibo Municipality, Zulia State.
Materials and methods: A cross-sectional study in 1400 subjects (women 54.7% and 45.3% men) who had a complete clinical history and measured blood glucose, lipid profile, insulin and lipoprotein (a). The normal behavior of the variables was determined using the Geary test and the results were expressed as mean ± SD. The group differences were studied by T-Student test or ANOVA one factor considered as significant when $p<0.05$.
Results: 0.7% (n = 10) of the population exhibited previous history of Myocardial Infarction (MI), presenting family history of hypertension (90%), MI (60%) and Type 2 Diabetes (DM2) (60%), and background Personal HBP (50%) plus an additional 10% with high BP who did not know their status (Systolic Blood Pressure = 138 ± 28.5 mmHg, Diastolic Blood Pressure = 84.5 ± 8.5 mmHg) with significant differences with the group without history of MI (Systolic Blood Pressure = 119.28 ± 17.14 mmHg, Diastolic Blood Pressure = 76.9 ± 11.5 mmHg, $p<0.05$) and DM2 (30%), coupled with this 70% had central obesity, low HDL 60% and hyperglycemia 50% without significant difference between groups. Moreover, the 1.43% of individuals had a history of angina pectoris, of whom 60% were hypertensive (Systolic Blood Pressure = 135.1 ± 18.74 mmHg, Diastolic Blood Pressure = 81.45 ± 10.1 mmHg) presenting differences with the group without a history of angina (Systolic Blood Pressure = 119.42 ± 17.14 mmHg, Diastolic Blood Pressure = 77.13 ± 11.51 mmHg, $p<0.05$). 65% of them had low HDL-c and 40% had hyperglycemia with no significant differences according to groups. Sedentariness was present in 70% of patients with heart attack and angina.
Conclusion: The 0.7% and 1.43% of patients had personal history of angina pectoris and MI, respectively. High Blood Pressure was the predominant personal and family history of triacylglicerides and the only significant difference between those with no or MI or angina.
Keywords: risk factors, myocardial infarction, angina pectoris, hypertension

No conflict of interest

P-1084

Uric acid levels in patients with acute coronary events

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Introduction and objectives: There is growing evidence on the possible association between high concentration of uric acid (UA) and cardiovascular disease. The objective of this research was to assess the levels of UA in patients with myocardial infarction (MI) and unstable angina (UA).
Materials and methods: We studied 180 patients divided into three groups: Group A, patients with IM (n = 60, female = 30, male = 30), Group B, patients with UA (n = 60, female = 29, male = 31) and Group C, control patients (n = 60, female = 30, male = 30) who had a complete clinical history, lipid profile and determination of UA. Statistical analysis was performed using the SPSS program for Windows ver.15. The distribution of variables was corroborated by the evidence of Z-Kolmogorov-Smirnov expressing the results as median or mean ± SD as appropriate. Comparisons were made by means of one factor ANOVA test or Mann-Whitney U as appropriate considering as significant a p value <0.05.
Results: There was no significant difference in anthropometric and blood pressure. The levels of uric acid in group A, B and C were 8mg/dL, 4mg/dL and 4 mg/dL respectively, showing statistically significant differences between Group A and B ($p<0.01$), group A and C ($p<0.01$) but not between Group B and C. Lipid profile values are displayed:

Patients	CT* (mg/dL)	LDL-c* (mg/dL)	VLDL-c* (mg/dL)	HDL-c* (mg/dL)	TAG* (mg/dL)
Group A	245,5	158,2	64	40,00±12,92	320
Group B	170,5	105	27	32,53±12,46	135
Group C	202,5	124	28,8	40,11±10,53	144

** One factor ANOVA: p <0.01*

Conclusions: Our results suggest that a high concentration of uric acid is an independent risk factor for myocardial infarction, but not for unstable angina.

No conflict of interest

P-1085

Cardiovascular risk in diabetic patients with hepatitis C

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Aim: The aim was to evaluate the association between chronic hepatitis C (CHC), insulin resistance (IR), and cardiovascular risk, in patients with CHC and type 2 diabetes.
Methods: We selected 80 patients with type 2 diabetes mellitus and chronic hepatitis C. We evaluated liver enzymes, lipids, insulin resistance (by Homeostasis model assessment - HOMA-IR) and CHD risk by the UKPDS prediction score. The liver fibrosis was non-invasively assessed using the Forns index, which depends on age, gamma-glutamyl transpeptidase, cholesterol and HDL-cholesterol; a value < 4.2 excludes liver fibrosis and a value > 6.9 is a predictor for significant fibrosis.
Results: The average age was 60.3±9.4 years. Obesity was present in 34.4% of patients. Forns index > 6.9 was associated with increased CHD risk (r = 0.68), low-density lipoprotein cholesterol (r = 0.54), alanine aminotransferase (r = 0.66), aspartate aminotransferase (r = 0.35), diastolic blood pressure (r = 0.39) and HOMA - IR (r = 0.43), high-density lipoprotein cholesterol (r = -0.50). The correlations hold also in multivariate analysis after adjusting for age and gender.
Conclusion: Increased CHD risk, and HOMA-IR are associated with high values of Forns index. Patients with hepatitis C and diabetes have a greater risk to develop cardiovascular diseases. The clinical impact of CHC on cardiovascular risk deserves particular attention because of the growing number of patients with CHC and diabetes.

No conflict of interest

P-1086

Vitamin D deficiency is associated with cardiovascular risk factors among Saudi patients with type 2 diabetes mellitus

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Aims: Very few studies have been done with regards to vitamin D and its impact in Saudi male and female patients with type 2 diabetes mellitus. This study aims to fill this gap.
Methods: Patients with type 2 diabetes (86 males and 71 females) were randomly recruited in this cross-sectional study. Anthropometric data were collected. Serum glucose and lipid profile were determined using routine laboratory methods. Serum insulin, adiponectin, resistin leptin, TNF-a, CRP, vitamin D and iPTH were measured using enzyme-linked immunosorbent assays.
Results: 57% of the female subjects had severe vitamin D deficiency while 43% were noted in males. Gender, BMI and LDL-cholesterol had modest but significant negative associations with vitamin D (p-values 0.012, 0.027, 0.005 respectively)
Conclusion: Severe vitamin D deficiency is highly prevalent among Saudi patients with type 2 diabetes. This study supports vitamin D supplementation as an adjuvant therapy for type 2 diabetes.

No conflict of interest

Complications - eye

P-1087

Prevalence of diabetic retinopathy and related risk factors in diabetic patients in Tirana district, Albania

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Backgrounds: Diabetic Retinopathy (DR) is a serious and frequent complication of diabetes. Often it is present since the diagnosis of type 2 diabetes. It remains largely preventable with proper screening, followed when required by proper interventions' therapy.
Objectives:
1. To define the prevalence of diabetic retinopathy in Tirana district.
2. To analyze the clinical features associated with this complication in the examined group.

Material and methods: As part of ALBDIAB Project, we examined all the medical records of diabetics updated during the last year. In total, we included 7226 diabetics. Male 3530 (48.8 %). 740 (10.2%) type 1 Diabetes and 6480 (89.3%) type 2. Type 1 Diabetes duration 9.7±7.8 years and T2 Diabetes duration 4.6±4.9 years. In all patients clinical and metabolical profiles were determined. Trained ophthalmologists defined the stages of retinopathy by ophthalmoscope after pupillary dilatation.
Results: Diabetic retinopathy of different stages was present in 43% of T1DM and 22% of T2DM. The multivariate analyses revealed that significant predictors for diabetic retinopathy were: diabetes duration (p= 0.0001 OR= 4.36), poor metabolic control as HbA1c >8% (p= 0.0015 OR= 3.02), insulin treatment (OR=4.24) and HTA =150/95mm Hg (p= 0.002 OR= 2.45) and smoking status more than 10 years (p= 0.0023 OR= 1.34) although for smoking 6-10 years OR= 0.57. We found a good correlation between retinopathy and nephropathy. The other features such as BMI, coronary artery disease and diabetes or HTA treatment were univariate predictors of diabetic retinopathy, but they lost significance in multivariate analyses.
Conclusions: Our study showed that DR remains one of the most frequent complication of Diabetes. We were able to confirm that type 2 diabetes with poor metabolic control, longer diabetes duration, nephropathy, uncontrolled HTA, and on insulin treatment are more prone to develop DR. The smoking status remains a controversial feature.

No conflict of interest

P-1088

The development of diabetes retinopathy in the senile-onset type 2 diabetes mellitus -- based on the Diabetes Case Management Program 2001, Taiwan

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Background and aims: In order to evaluate retinopathy in the senile-onset type 2 diabetes mellitus and ensuing development of primary preventive interventions in the geriatric diabetes population, a nationally standardized, multi-professionally integrated, evidence-based and patient-centered healthcare program -- DCMP 2001 was implemented in a medical center, Mid-Taiwan.
Materials and methods: From Jan. 2003 to Dec. 2006, 8238 diabetes beneficiaries were randomly and cumulatively recruited in DCMP 2001 via outpatient clinic visit. Accordingly, the lifestyle measurements (lifestyle I: no smoking, no alcohol and regular exercise; lifestyle II: smoking and/or alcohol and/or no exercise), total daily caloric intakes, macronutrient consumptions and lifestyle and dietary recommendations were tri-monthly recorded following

adequate history taking in each diabetes patient after seeing physician. The annual eye examination was routinely performed in patients enrolled in DCMP 2001 within one month by using the digital retinal photography. All the baseline data in this cohort were used for study. The ages of onset of diabetes calculated by subtracting the duration of diabetes from age were further divided up into 3 groups, < 40 years (n=1305), >=40 to < 65 years (n=4718), and over 65 years (n=972) for analysis. Comparisons between groups were performed by using multiple comparisons among slopes and Chi-Square test. The significant level was set at $p<0.05$.

Results: The relationship between different age ranges of onset of diabetes in the prevalence of diabetes retinopathy was demonstrated in Fig. 1. It was clearly indicated that the development of diabetes retinopathy occurring in senile-onset T2DM was significantly slower than T2DM with onset at ages less than 40 ($p < 0.01$). The initial ~10 years after developing T2DM, however the prevalence of retinopathy was shown higher in T2DM with onset at ages over 65 as compared with ages less than 40. Neither lifestyle nor macronutrient consumption had significant impact on the prevalence of diabetes retinopathy in senile-onset T2DM.

Conclusions: The cross-sectional aforementioned results clearly indicated that the prevalence rates of diabetes retinal complication were also determined by the age of onset of diabetes, whereas diabetes retinopathy in the senile-onset T2DM was lower, even though the first ~10 years was higher as compared with onset of diabetes at ages less than 40. Therefore, for the primary prevention of the development of diabetes retinopathy in high risk geriatric population, further study would be required.

No conflict of interest

P-1089

Survival free of retinopathy differs according to aldose reductase microsatellite alleles

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The aim of the study is to examine whether the "survival free" period for retinopathy is linked to aldose reductase microsatellite alleles.

Two hundred and sixty Australian adolescents with type 1 diabetes attending for complication screening were genotyped. The aldose reductase microsatellite region was amplified by Polymerase chain reaction to produce fragments of 126-152 base pair (Z = 138). Kaplan-Meier survival analysis was used to determine duration free of retinopathy according to genotypes Z-2/Z-2, Z-2/non Z-2 and non Z-2/non Z-2. Stereoscopic fundal photography was performed blinded to the patients' genotype. The presence of background retinopathy was defined as any microaneurysm or hemorrhage.

The results of our study shows that, Median survival time free of retinopathy was significantly shorter in patients having the Z-2/Z-2 genotype (8.8 yr) or the Z-2/non Z-2 genotype (9.6 yr) compared to the non Z-2/non Z-2 genotype (11.8 yr) ($p=0.01$).

So we concluded that, the Survival free of retinopathy was significantly reduced in Australian patients with a Z-2 allele and not with other alleles. This may represent the functional mechanism of the reduced duration free of retinopathy in patients with a Z-2 allele.

Key words: aldose reductase, diabetes, microangiopathic complications, genetic polymorphism, dinucleotide repeat

No conflict of interest

P-1090

Diabetes and blindness in Mexico: The role of poor quality of care

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Rationale: Even though clinical trials have shown that glycemic control reduces the incidence of chronic complications, diabetes is one of the leading causes of non traumatic blindness worldwide. In Mexico, lack of coverage or limited access to the public and private services, deficiencies in the quality of diabetes care, low rates of dilated eye examinations, scarcity and denial of diabetes educators, organizational deficiencies, scarce economic resources, and shared lack of interest are leading contributing factors.

Objective: Investigate the quality of previous diabetes care in patients treated for ophthalmologic complications in Mexico as a contributing factor in the pathogenesis of diabetes complications.

Patients and methods: Starting in 2006, agreements were made to provide structured diabetes education to patients seeking specialized treatment at the three largest Opthalmology hospitals in the country, and at a public tertiary level hospital, in Mexico city. Patients invited received a survey in which history of diabetes was investigated, including age and diagnostic methods, glycemic control, treatment, cardiovascular risk factors and chronic complications.

Results: 900 patients were analyzed for this report: 557 females and 343 males. Despite that these hospitals are devoted to treat persons without access to social security, 25.2% of them had this type of "coverage". Comparative percentages, odds ratios (OR) and statistical significance regarding methods of glycemic control, treatment modalities, cardiovascular risk factors and complications in patients with social security and without social security, in some of the variables investigated are shown in the table:

Variable	Patients with SC	Patients without SC	Odds ratio	P
Fasting blood glucose	57.2%	54.4%	1.12	0.91
Capillary blood glucose	48.0	49.1	0.95	0.95
A1c	6.1%	2.9%	2.13	0.29
Diet	32.0%	30.7%	1.06	0.90
Insulin therapy	20.6%	14.7%	1.49	0.24
No therapy	10.6%	15.3%	0.65	0.31
Hypertension	58.01%	53.25%	1.21	0.48
Retinopathy	52.67%	53.84%	1.03	0.93
Blindness	18.32%	19.52%	0.92	0.90
Diabetic foot	12.21%	8.87%	1.42	0.45
Current smokers	15.26%	3.55%	4.89	<0.001
Amputations	3.05%	3.55%	0.85	0.93

Conclusions: The results of this survey clearly demonstrate that poor quality of diabetes care is a leading contributing factor in the pathogenesis of diabetic eye disease and blindness in Mexico. Glycemic control is based on fasting and capillary casual measurements; A1c is rarely used, even at social security institutions. Overall, quality of diabetes care is worse in recipients of social security in Mexico than in patients without access to these services. One fourth of the patients treated at these public hospitals should be receiving this type of specialized care at the institution that charges to provide health services. Rates of diabetic foot are also higher in the insured.

No conflict of interest

P-1091

Positive effects of angiotensin receptor blocker on the course of microvascular complications of diabetes mellitus

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Aim: Evaluate in dynamics the regulatory mechanisms of some clinical and hemodynamic indices in patients (pts) with type 1 and type 2 diabetes (DMT1 and T2) at an early stage of diabetic retinopathy (DR), and their correction with angiotensin II receptor blocker (AT_2).

Materials and methods: Totally, 250 DMT1 and T2 pts were studied, they were divided into 3 groups (Gr.): Gr.1 (n=115) – no DR; Gr. 2 (n=43) – DMT1 and DR; Gr.3 (n=92) - DMT2 and DR. Using physical examinations we assessed their clinical status, lipid profile, microalbuminuria, urine creatinine, and glycemia levels. Pts were treated with candesartan (16/ 32 mg). When necessary, other antihypertensive agents (except ACE-inhibitors) were added. Eye fundus monitoring was performed - evaluation of 7, 30^0 - standard zone stereoscopic retinal pictures according to ETDRS.

Results: Three years post treatment no pathologic changes on retina in normotensive and normoglycemic pts were observed; repeated examinations demonstrated that normotension/normoglycemia in mild DR at baseline were associated with regression of changes. When more serious changes of various severity were present, the examinations revealed either no changes (72/75, 96%), or DR deterioration (proliferative DR, neovascularisation stage), (4%).

Conclusion: Results obtained showed that use of candesartan in DM resulted in regression of pathologic changes on retina and decrease in urinary albumin

excretion rate. Thus, we recommend including candesartan in the standard treatment, due to its positive effect on the course of diabetes microvascular complications in males and females.

No conflict of interest

P-1092

Study: regular annual eye screenings and early detection of diabetes eye related disease

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Introduction: Diabetes eye related disease is very common in patients with diabetes. If not detected early can lead to blindness. People with diabetes are 25 times more likely to become blind than those without diabetes. The disease does not have any early warning symptoms such as pain, and vision may not change until the disease becomes severe. Annual eye screening for patients with diabetes plays a very important role in detecting diabetic eye disorders.
Objective: Regular annual eye screening for patients with diabetes help in early detection of diabetic related disease and reduce the rate of blindness.
Method: Diabetic Society of Singapore performed diabetic retinal photography screenings for patients with diabetes every year. In 2008, 956 patients were informed to attend their appointments to get their eye screenings done.
Results: 956 patients had their diabetic retinal photography screenings done, 248 patients were detected to have diabetic related diseases such as glaucoma, maculopathy, proliferative non-proliferative bleedings and aged related maculopathy, 678 patients retina photography results were normal. The 248 patients with diabetic related eye diseases were referred to eye specialists for treatments and will be closely monitored for follow-up visits.
Conclusion: Regular yearly diabetic eye screenings play an important part in early detection of diabetic eye related disease and helps in reducing the rate of blindness. This will not only help to save more eye sights but also reduce healthcare costs in the long run.

No conflict of interest

P-1093

Heart rate variability in non-proliferative diabetic retinopathy

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Background and aims: Diabetes Mellitus (DM) is a serious medical and social problem. Elevated blood glucose levels cause pathologic changes in all organs and systems of the human organism. DM is a common cause of autonomic neuropathy. Cardiac autonomic neuropathy (CAN) is asymptomatic in one fifth of patients and can be revealed while heart rate variability is assessed. The aim of our work was to study the heart rate variability and arterial blood pressure (ABP) changes in patients with diabetic retinopathy (DR).
Materials and methods: In total, 250 patients with DM were enrolled in the study. Based on clinical data they were allocated to following groups (Gr.): Gr. 1 (controls) – 115 patients with type 1 and type 2 DM, mean ABP – =130/85mmHg, fundus photography grading 10/10; and Gr. 2 (study) where 135 patients were subdivided into Gr. 2a, n=43 type 1 patients with mean ABP =130/85 mmHg and fundus photography grading from =20/10 to =47/47; and Gr. 2b, n=92, type 2 patients with mean ABP =160/90 mmHg and fundus photography grading from =20/10 to =47/47. Diabetes duration in the groups was 7±1,6, 6,6±1,9 and 8,3±2,4 yrs, respectively. According to fundus examination: Gr. 1 – no DR was registered; Gr. 2a – mild DR – 28 patients, moderate DR – 15 patients; Gr. 2b – mild DR – 61 patients, moderate DR-22 patients, severe DR – 9 patients. Heart rate variability (HRV) was assessed based on following parameters: SDNN, PNN50 (%).
Results: In hypertensive patients (Gr. 2b), comparing with normotensive ones (Gr. 1 and 2a) decrease in 24h HRV indices was observed. Besides, hypertension associated with disorders in normal circadian dynamics. While assessing mean 24h circadian HRV data, QT-interval and QT-corrected by Holter monitoring it became obvious that in hypertensive patients, compared to normotensives, QT interval prolongation in daytime was observed.
Conclusion: Thus, elevated ABP in patients with DM is associated with a number of negative electrophysiological shifts in left ventricle myocardium that result in its hypertrophy and dysfunction of the vegetative nervous system. Risk of CAN development depends on the diabetes duration and glycemia control and increases together with development and progression of other complications, such as retinopathy and nephropathy.

No conflict of interest

Complications - foot

P-1094

Diabetic foot osteomyelitis can be successfully treated with antibiotics

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Background: Osteomyelitis (OM), a common complication of diabetic foot ulcer, is associated with higher risk of amputation. In our centre we treat OM primarily with antibiotics and we wanted to study the outcome of patient who had diagnosis of OM.
Aims of study: The aim of this study was to analyse clinical outcome of subjects who had diagnosis of OM in the past 5 years.
Subjects and methods: In this retrospective study, cases were selected from the electronic record with the diagnosis of OM. Results were crosschecked with radiology database. Pathology and microbiology database were also used to collect data.
Results: 147 cases had clinical diagnosis of OM out of which 130 (mean age 66.2±14.4 years and mean duration of diabetes 13.2±10.9 years) had diagnosis reconfirmed on at least one of the established criteria (Probe to bone 102, X-Ray changes 69, Bone scan 27, leukoscan 4 and bone biopsy 5). Of these reconfirmed cases, majority (66.9%) were male and had type 2 diabetes (80%) with mean HbA1c of 8.1± 2.1% and cholesterol of 4.2±1.5 mmol/L. Peripheral vascular disease, defined by absence of palpable pulses, was present in 61 (46.9%) subjects. Blood count performed on 112 cases showed raised neutrophil count (>7.5) only in 26 (23.2%). 64 had staphylococcus isolated from wound swab of which 20 (31.3%) had MRSA. Flucloxacillin and fusidate combination was used in 81 cases whereas ciprofloxacin and clindamycin combination was used only in 17 cases. 87 (66.9%) healed with single (n=46) or multiple (n=41) courses of antibiotics. 18 (13.8%) had amputation of which 16 (12.3%) were minor (Toes or Ray amputation) and 2 (1.5%) were major (above or below knee). 12 (9.2%) had vascular intervention (8 angioplasty & 4 bypass) and 8 (6.2%) died within 12 months of diagnosis due to other causes. There were no differences in outcome between subjects with or without x-ray changes. When compared between those which healed (n=87) and those patients who died or needed amputation (n=26), there was no difference in age, sex, duration of diabetes, site of ulcer, presence of x-ray changes or peripheral vascular disease. OM due to MRSA was the only factor that predicted adverse outcome (21.1% vs 53.3%; p=0.04). Higher rate (p=0.01) of adverse outcome was noted in patients using combination of ciprofloxacin and clindamycin, which may be due to its use as a last resort in our clinic.
Discussion: Our data confirms that OM can be successfully treated with antibiotics. Flucloxacillin and fusidate can be used as first line treatment in majority of cases. Surgery should be reserved only for cases that fail to respond to medical treatment.

No conflict of interest

P-1095

Spectrum of microbial flora and their susceptibility to antibiotics in diabetic foot infections in an African setting: case of Yaounde central hospital

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Background: Diabetic foot infections are a common cause of morbidity and mortality in people with diabetes in Africa. But, there are few local studies about bacterial ecology and probabilistic antibiotherapy in diabetic foot infections, since many patients cannot afford bacterial culture. The aim of this study was to determine the common bacteriological flora of diabetic foot infections and their sensitivity to antibiotics in order to inform possible empirical treatment.
Methods: We consecutively collected deep wound swabs from 34 diabetic patients admitted for foot infections and/or gangrene at the diabetes unit of the Yaoundé central hospital from August 2006 to January 2008. Bacteriological isolation and antimicrobial sensitivity tests were carried out by standard microbiological methods.
Results: A total of 65 microorganisms (64 bacteria and 1 fungi) were isolated with an average of 1.94 ± 0.85 germs per case. Infections were polymicrobial in 70.6% of the patients. Gram negative germs constitute 75.4% of isolates and there was an association of both Gram positive and negative in 40.6% of patients. The most isolated germs were Morganella morganii, Staphylococcus aureus, Escherichia coli, and Pseudomonas aeruginosa in 35%, 26%, 23% and 21% of patients respectively. All bacteria showed a high sensitivity to imipenem, amikacin, ceftazidim for Gram-negative; erythromycin and lincocin for Gram-positive. Contrary to previous studies, there was a worrying resistance to penicillin, amoxicillin+clavulanic acid and second generation's quinolones which before were the first line probabilistic antibiotherapy recommended in our milieu for diabetic foot infections.
Conclusions: Infections of diabetic foot are usually polymicrobial with a high association of both gram positive and negative bacteria. Probabilistic antibiotherapy in our milieu should associate imipenem or amikacin or ceftazidime and erythromycin or lincocine. The highly used fluoroquinolones should be abandoned.

No conflict of interest

P-1096

The multiple diagnostic approaches in diabetic patients with peripheral arterial disease

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Objective: To evaluate the involvement of different arterial segments in diabetic patients with peripheral arterial disease (PAD).
Materials and methods: Between September 2008 and February 2009 42 diabetic subjects referred to Diabetic Foot Department with clinical signs of limb ischemia. In cases with reduced or absent foot pulses, reduced ankle systolic blood pressure and TcPO2, duplex scanning (DS) of leg/foot, carotid and renal arteries was performed. In case of stenosis more than 50% of vessel diameter, arteriography and peripheral transluminal angioplasty (PTA) was performed. In patients unsuitable for PTA, by-pass graft (BPG) was considered.
Results: 12% of patients had neither an ulcer nor a rest pain. In 42 patients at least one pedal pulse was reduced or absent, and ankle-pressure was able to evaluate only in 50% (n=21) cases due to medial calcifications and/or ulcer on the dorsal part of the foot. In all patients the TcPO2 was <50mmHg, and in 82% (n=34) cases it was < 30mmHg. DS demonstrated Sn >50% of vessel diameter of leg in all subjects. All these patients were referred for an angiographic study. Obstructions of >50% of vessel diameter were located in the iliac/femoral-popliteal axis in 5% (n=2), exclusively in the infrapopliteal axis in 38% cases (n=16), and in both femoral-popliteal and infrapopliteal axis in 57% (n=24). In 47% (n=20) cases was found out stenosis of carotid arteries >50%, and in 24% (n=10) >70%, in 2 cases was revealed the occlusion of carotid artery at one site. In 19% (n=8) cases was found out >50% stenosis of renal arteries and in 2 cases occlusion by one site documented. Revascularization of peripheral arteries was performed in 83% (n=35) patients. A concomitant PTA procedure was performed in 76% (n=32) patients, and there was 15 of stents placed in femoral arteries. A BPG was performed in 10% (n=4) patients. In 17% (n=7) patients neither a PTA nor a BPG was possible due to high surgical risk or lack of outflow, they were treated by a prostanoid therapy. The patients with stenosis >70% of carotid and renal arteries were operated (2 endarterectomy of carotid arteries and 2 PTA with stenting of renal arteries). Follow up outcome will be assessed in all cases.
Conclusion: The multiple diagnostic approaches in diabetic patients with occlusive peripheral disease are highly necessary. The inspection of carotid, renal arteries by using DS as well as peripheral arteries is needed. About 20% and more diabetic patients needed revascularization of carotid and renal arteries.

No conflict of interest

P-1097

Determining ambulatory diabetic patients' health status in the primary public health system of Esteli, Nicaragua

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Introduction: In Nicaragua, diabetes was the third cause of death according to the 2007 national statistic report of the Ministry of Health. Its prevalence was estimated to be 9 % in 2003. Handicap International in partnership with the Ministry of Health has implemented the project "prevention and diminution of the complications by diabetes in the department of Estelí, Nicaragua". In the framework of this project, one baseline epidemiological study was realised on the health status of diabetic outpatients.
Objectives: To determine the glycemic control, complications and cardiovascular risk factors of primary health care diabetic outpatients of the six municipalities of Esteli, Nicaragua
Methodology: This cross sectional study included 313 outpatients with diabetes who were randomly chosen in the list of registered patients in the primary health care units. Four consultations during the last year was the selection criterion.
Each patient answered a questionnaire and underwent medical examination and biological tests. Tests included ophthalmologic, neurological and foot examination; and hemoglobin A1c, lipid profile, fasting and postprandial glycaemia, serum creatinine and microalbuminuria determination.
Results: Of the 313 patients, 66% [61-71] were women and 90% [87-93] were more than 40 years of age. Regarding the disease, 91% [88-93] have type 2 diabetes and 73% [68-78] have been diagnosed for less than 10 years. 76% [71-81] of the patients had Hemoglobin A1c level above the threshold of 7%.
Considering cardiovascular risk factors, 60% [55-65] had hypertension, 7% [4-10] were smoker, 31.2% [26-36] had hypercholesterolemia, 48.4% [43-54] had hypertriglyceridemia and 53% [47-59] declared having a family history of diabetes. The mean BMI was 28 kg/m2 in people with type 2 diabetes and 24 kg/m2 in people with type 1 diabetes.
Lastly, regarding chronic complications, retinopathy was clinically found in 39.2% [34-45] of the cases, cataract in 29% [24-34], glaucoma in 20% [16-24], symptoms of angina in 4.8% [2-7], strokes in 1% [0-2], microalbuminuria in 38.9% [34-44], lower limb neuropathy symptoms in 58.6% [53-64], intermittent claudication in 39.2% [34-45], chronic foot ulcer in 12.4% [9-16] and amputation in 5.1% [3-8].
Conclusion: The prevalence of chronic complications found in this study was generally in the range of the complications prevalence found in other clinic-based studies (from 2006 IDF diabetes Atlas). Nevertheless, we noticed that the amputation prevalence was higher than the IDF data of 4.8%. The quality of diabetes care needs to be improved in these primary health care units. The ophthalmologic and diabetic foot follow-up and care must be given attention to decrease the visual impairment and amputations respectively.

No conflict of interest

P-1098

Manitoba First Nations Patient Wait Time Guarantee pilot project

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The Canadian government's health care plan calls for a guarantee that ensures that all Canadians receive medical treatment within wait times that are clinically acceptable. Fundamental to a wait time guarantee is defined time frames for care and a set of alternative care options, should that time frame be exceeded (recourse). In January 2007, a unique Patient Wait Time Guarantee pilot project for the prevention, treatment and care of diabetic foot ulcers among Manitoba First Nations (MFNs) was announced. The project involved a partnership between an innovative home care nursing organization, Saint Elizabeth Health Care (SEHC), and a First Nations leadership advocacy organization, the Assembly of Manitoba Chiefs (AMC). Within a PWTG framework, the project partners sought to establish a clinical care pathway, benchmarks for care and recourse options for patients who do not receive treatment within this time frame. The difficulty in testing the clinical benchmarks is that the real challenge facing people living with diabetes in MFN communities was more a matter of access than wait times. Funding for community based foot care services is inconsistent and insufficient resulting in considerable disparity in foot care services. As a result persons living with diabetes rarely have their feet assessed.This lack of assessment, early intervention, and care means that all too often MFNs are presenting for care of their diabetic foot ulcer at a stage when amputation may be the only option. Basic primary foot care services are critical to addressing this issue. However, the project partners also understood that there were challenges far more fundamental then access to health care impacting this issue for MFNs. Action on the broader determinants of health (housing, water, food) impacting MFNs will be necessary to truly address the higher rates of diabetes and the shockingly disproportionate rates of amputations.The issues of care and access to care also cannot be viewed only through a western or biomedical model. This project was committed from the outset to consider all effective options, including traditional healing, and to build a solution that recognized and emphasized MFN cultural values and perspectives. This project demonstrates that the most effective model to change wait times, and understand the reasons underlying those waits, is not to rely on health care professionals alone, but instead, to adopt different ways of involving the people most affected. The project also documented important lessons learned for improving health care and wait times for FNs and for all Canadians. The approach, finding, and recommendations from this important project will be shared in this presentation.

No conflict of interest

P-1099

The role of taking history in diabetic neuropathy diagnosis

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Introduction: Diabetic neuropathy (DN) is one of the most common complications of diabetes mellitus (DM). Its prevalence is about 25%. Early DN diagnosis results in improvement of patients quality of life and outcomes.
Aims: Estimation of usefulness of taking history in early DN diagnosis.
Methods: Into the study 80 patients (41 females, mean age 66,4 +/- 13,3 years) with DM were included. The prevalence of DN symptoms was estimated according to questionnaire prepared by ourselves containing symptoms of 4 types of DN: chronic peripheral polyneuropathy (CPP), autonomic neuropathy (AN), mononeuropathy (MN) and acute-onset neuropathy (AON). Time from DM onset and presence of other DM complications were also analized.
Results: One or more DN symptoms were diagnosed in 68 (85%) patients. The most common were CPP symptoms (57 patients, 71,3%) and AN symptoms (56 patients, 70%). AON symptoms were found in 28 patients (35%) and MN symptoms in 12 patients (15%). Among patients reporting DN symptoms, more often other DM complications were found (85,3% vs 50%), longer time from DM onset (13,05 +/- 9,76 years vs 8 +/- 9,77 years) and insulin used (63,2% vs 50%).
Conclusions: DN symptoms are observed in about 3/4 patients with DM, the most common were CPP and AN symptoms. This serious complication prevalence correlates with time from DM onset, presence of other chronic complications and insulin-use.

No conflict of interest

P-1100

Ankle-Brachial Index abnormalities in Nigerian patients with diabetic foot ulceration

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Background: Foot ulceration is a major cause of morbidity and mortality in diabetes mellitus patients worldwide. It often occurs in a background of neuropathy and peripheral arterial disease (PAD). Peripheral arterial disease can be assessed clinically or more accurately with the use of simple devices such as a mini-doppler which unfortunately is not readily available in resource poor settings.
Aim: To determine the prevalence of peripheral arterial disease in patients with diabetes mellitus foot syndrome in a tertiary health care centre in Nigeria using mini-doppler.
Methods: An analysis of the mini-doppler findings of patients with diabetes mellitus foot syndrome (DMFS) was done. The data retrieved from the mini-doppler report included the age, gender, presence of hypertension, smoking history and ankle-brachial pressure index (ABPI). Peripheral arterial disease was defined as the presence of ABPI of < 0.9.
Results: There were 64 patients, 28 (43.8%) females and 36 (56.3%) males. The mean age of the study participants was 63.9 (10.9) years. Hypertension was present in 56% of the patients and 15.7% had a significant smoking history. The mean ABPI was 0.9 (0.4) with no significant difference in APBI in the males and females ($p=0.12$). Decreased ABPI indicating PAD was present in 27 (42.2%) patients, 14 (51.9%) males and 13 (48.1%) females. There was no difference in the frequency of PAD in the males and females ($p=0.32$). PAD was not significantly associated with a significant smoking history or presence of hypertension ($p=0.19$ and $p=0.47$ respectively) or with age in the study population ($r=0.2$, $p=0.20$).
Conclusion: The contribution of PAD to the development of diabetes foot ulceration appears high in this population of Africans with diabetes. It can be reliably detected with the use of simple devices like the mini-doppler. Such devices should be made available at least in major hospitals in resource poor settings for better management of DMFS.

No conflict of interest

Guidelines, clinical care

P-1101

Comparative investigation of glucose fluctuation in subjects with type 2 diabetes, prediabetes and normoglycemic subjects measured by CGMS

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Introduction/background: Glycemic homeostasis has been shown to be associated with oxidative stress and endothelial dysfunction. So far little is known on glycemic variability in different stages of dysglycemia. We compared parameters of glucose fluctuation measured by continuous glucose monitoring system (CGMS) in subjects with Type 2 diabetes (T2D/3), prediabetes (PD/2) vs. normoglycemic subjects (NGT/1).
Material and methods: Overall 218 adults participated in the study: 47 NGT, 61 PD and 110 T2D. The method of CGM allows to measure tissue glucose values for every five minutes during 72 hours. We used CGMS by Minimed with Gold sensor (Medtronic Inc.). At the second day (D2) the subjects got a standardized test meal (TM). We compared parameters of glucose excursion: fasting tissue glucose before test meal (TM0), peak of TM (TMp), 2h tissue glucose after TM (TM120), AUC 2 hours after TM (TMAUC), ascent after TM (TMa), mean amplitude of glucose excursion during day 2 (MAGED2) and during the day 3 (MAGED3), average tissue glucose during day 2 (avD2) and day 3 (avD3), standard deviation of mean tissue glucose during day 2 (SDD2) and day 3 (SDD3) in NGT to those with PD or T2D.

Results:

Mean (SD)	NGT (1)	PD (2)	DM (3)	P
Age [yrs]	55.0 (17.7)	65.8 (5.6)	63.4 (8.4)	1 vs. all p<0.001
BMI [kg/m*]	26.6 (3.9)	29.5 (4.5)	30.9 (5.0)	1 vs. all P<0.05
avD2 [mmol/l]	5.6 (0.8)	6.1 (0.8)	7.5 (2.2)	3 vs. all p<0.001
avD3 [mmol/l]	5.9 (0.7)	6.3 (0.8)	7.4 (1.9)	3 vs. all p<0.001
TM0 [mmol/l]	5.3 (0.9)	6.1 (1.1)	7.0 (2.4)	3 vs. all p<0.05
TM 120 [mmol/l]	5.8 (1.1)	6.5 (1.3)	9.6 (3.7)	3 vs. all p<0.001
TMa [mmol/h]	0.7 (0.6)	1.1 (0.8)	2.5 (2.1)	3 vs. all p<0.001
SDD2 [mmol/l]	0.8 (0.3)	1.1 (0.5)	1.8 (0.8)	3 vs. all p<0.001
SDD3 [mmol/l]	0.8 (0.4)	1.0 (0.4)	1.5 (0.8)	3 vs. all p<0.001
MAGED2 [mmol/l]	1.6 (0.6)	2.1 (0.9)	3.5 (1.9)	3 vs. all p<0.001
MAGED3 [mmol/l]	1.7 (0.8)	2.1 (1.0)	3.3 (2.2)	3 vs. all p<0.001
TMp [mmol/l]	7.4 (1.4)	8.8 (1.9)	11.4 (3.5)	1 vs. all p<0.05 **2 vs. 3 p<0.001**
TMAUC [mmol/l*h]	12.9 (2.2)	15.1 (2.8)	19.3 (6.0)	3 vs. all p<0.001
HbA1c [%]	5.4 (0.4)	5.6 (0.3)	6.8 (1.5)	3 vs. all p<0.001

Conclusions: In our study as expected T2D patients have the highest levels of parameters of glucose homeostasis measured by CGM. Significant differences between prediabetic and normoglycemic subjects were found only in the glucose peak (CGM) after the testmeal. CGM may be an additional helpful method to estimate dimension of the dysglycemia.

No conflict of interest

P-1102

The change in plasma calcium is associated with those in lipids and glucose tolerance in Japanese subjects with fatty liver

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Aims: Recently, an association has been reported between several abnormalities which characterize the metabolic syndrome and plasma calcium in a normal population. In the present study, we investigated the possibility of change in plasma calcium as a marker for aggravation of blood pressure, dyslipidemia and glucose tolerance in subjects who received the oral glucose tolerance test (OGTT) annually in clinical check-up in our Institute.

Methods: The study included a total of 314 subjects (age 30 to 80 years, male: n = 211, female: n = 103). They received OGTT, routine blood chemistry tests as well as physical examinations in the annual regular check-up of Department of Preventive Medicine of our Institute during 2005 to 2008. The same examinations were performed one year after the first examinations. Their age was 62.6 ± 0.6 SE years. The subjects were divided into two groups depending on the presence (n = 177, male: n = 138, female: n = 39) or absence (n = 137, male n = 73, female: n = 64) of fatty liver, which was based on the diagnosis by ultrasonography. The correlation between the changes in plasma calcium and those in other parameters during one year follow up were studied by linear regression analyses.

Results: First, we investigated the relationship between the changes in all parameters in the subjects as a whole. There was a significant correlation between the changes in plasma calcium and those in HbA1C (r = -0.28, P = <0.001), 2-hour post-challenge plasma glucose levels (PCPG) (r = 0.11, P = 0.03), low density lipoprotein cholesterol (LDL-C) (r = 0.19, P = <0.001), high density lipoprotein cholesterol (HDL-C) (r = 0.32, P = <0.001) and triglyceride (r = 0.12, P = 0.02).

Second, we investigated the relationship between various parameters in a subgroup of subjects with fatty liver. There was a significantly positive correlation between the changes in plasma calcium and those in HbA1C (r = -0.24, P = <0.001), 2-hour PCPG levels (r = 0.11, P = 0.03), LDL-C (r = 0.23, P = 0.001), HDL-C (r = 0.30, P = <0.001) and triglyceride (r = 0.16, P = 0.02). Finally, the relationships between the changes in parameters were examined in a subgroup of subjects without fatty liver. The changes in plasma calcium showed a significant correlation with those in HbA1C (r = -0.24, P = <0.001) and HDL-C (r = 0.32, P = <0.001), but there was no correlation with LDL-C and triglyceride.

There was no correlation between the change in plasma calcium and those in liver enzymes, blood pressure, waist circumference, body mass index and body weight among the subjects.

Conclusion: The change in serum calcium levels over one year can be a predictor of aggravation of dyslipidemia in Japanese subjects, especially in those with fatty liver. The change in 2-hour PCPG showed a positive association with those in plasma calcium whereas the change in HbA1C is negatively correlated with those in plasma calcium.

No conflict of interest

P-1103

Thyroid autoimmunity is not linked to low free T3 syndrome in type 2 diabetes subjects

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Background: Like diabetes, diseases of the thyroid gland are amongst the most abundant endocrine disorders in the world. An overactive thyroid may increase insulin requirements, while an underactive thyroid can decrease insulin requirements. Thyroid hormone affects carbohydrate metabolism, mainly by modifying the effects of other hormones such as catecholamine and insulin.

Aims: The aim of the study was to observe the relation of thyroid dysfunctions in type 2 diabetic subjects (T2DM), to measure the glycemic status, levels of thyroid hormones, thyroid antibodies and lipid profile in a Bangladeshi population.

Materials and method: The study was conducted in the Research Division, BIRDEM in the period of 2007-08. A total of 50 healthy T2DM subjects were taken from the out patients department. Of them 16 were female. Again 50 healthy age sex matched control (without self and family history of Diabetes and Thyroid diseases) were taken to compare and among them 17 were female. Clinical and biochemical tests were done in the standard laboratory (WHO recognized).

Results: The mean± SD age of T2DM subjects were 41.86 ±6.43 and control was 41.54±7.88. Fasting blood glucose (FBG) was significantly higher in T2DM subjects than control (p<0.001) and mean HbA1c (%) was also significantly higher in T2DM subjects than control (p<0.001). Serum TSH level was significantly lower in T2DM subjects than that of control group (p<0.01). No significant difference was observed in serum free T4 (FT4) levels between two groups (15.42±2.90 vs 15.61±2.98). Serum free T3 (FT3) level was significantly lower between two groups (p<0.001). Thyroid auto-antibodies showed a significantly lower anti TG level in T2DM subjects than control (p<0.05). It has been found that FBG levels and HbA1c were abnormally high and serum FT3 were abnormally low in T2DM subjects. Levels of TSH, FT4, anti TG and anti TPO were all within the normal range in T2DM subjects. A significantly negative correlation was found in serum FT3 with FBG and HbA1c (r= - 0.789**, p= 0.0001 and r= -0.820**, p=0.0001 respectively) irrespective of the groups. Lipid profile analysis showed significantly higher total cholesterol (p<0.05), LDL cholesterol (p<0.001) and lower HDL cholesterol levels (p<0.001) in T2DM subjects than control group, with levels within the normal range.

Conclusions: The findings of the study suggest that Bangladeshi population indicates the possibility of low FT3 syndrome in T2DM subjects, in which thyroid autoimmunity is not related.

No conflict of interest

P-1104

Type 2 diabetes mellitus, impaired fasting glucose, impaired glucose tolerance and cardiovascular risk factors in patients with autoimmune thyroiditis

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Introduction: Thyroid hormones modulate enzyme activity, receptor expression, and lipid breakdown and clearance, thereby contributing to the expression of the lipid phenotype, especially in impaired fasting glucose (IFG), impaired glucose tolerance (IGT), and diabetes mellitus (DM).

Aims: To examine the hypothesis that thyroid function, in euthyroid subjects with autoimmune thyroiditis (AIT), is associated with IFG, IGT, DM, insulin resistance, serum lipid concentrations, homocysteine, and CRP (C-reactive protein).

Methods: We recorded thyroid function tests, BMI, insulin resistance markers comprising the HOMA-IR, QUICKI, IGI (Insulinogenic Index) and the levels of total cholesterol (TC), HDL, LDL-cholesterol, triglycerides, apolipoprotein B (ApoB), ApoA1, lipoprotein (a), homocysteine, CRP (C-reactive protein), folic acid and vitamin B12, in 255 patients with AIT with a mean age of 45,8±12,8 years and a mean BMI of 27,6±5,8 Kg/m2. Patients with AIT were treated with levothyroxine, in order to normalize FT3, FT4 and TSH levels. A 75-g OGTT was performed and blood samples were obtained every 30 min for 120 min to measure plasma glucose, insulin, and C-peptide.

Results: After dividing the sample in 3 groups (IFG-16,6%, IGT-24,2% and DM-9,6%) we found that patients with IFG had significantly higher levels than IGT patients in C-peptide (3,73±1,43ng/ml vs 2,69±0,73ng/ml; p=0,01), homocysteine (9,49±2,89µmol/l vs 7,42±1,34 µmol/l; p=0,002) and HOMA-IR (3,90±2,80 vs 2,16±1,09; p=0,01). In the whole sample we observed significant correlations between TSH and insulin (r=0,23; p=0,02), C-peptide (r=0,21; p=0,02), TC (r=0,40; p<0,001) and IGI (r=0,19; p=0,03). In the IFG group we found significant negative correlations between FT3 and TC (r=-0,54; p=0,01), LDL (r=- 0,59; p=0,006) and ApoB (r=-0,55; p=0,03). In the IGT group we detected significant correlations between insulin and CRP (r=0,59; p=0,002) and between homocysteine and anti-TPO antibodies (r=0,49; p=0,02).

Discussion/conclusion: Even in the euthyroid range, TSH was positively associated with insulin, C-peptide, and IGI, in this group of patients with IFG, IGT, DM, and AIT. In patients with IFG, FT3 was negatively associated with TC, LDL, and ApoB. In the IGT group, insulin was positively associated with CRP, and homocysteine was positively associated with anti-TPO antibodies. These findings suggest a pro-atherogenic pattern associated to the low grade of chronic inflammation in euthyroid patients with AIT. Thyroid function and lipid levels are associated with prediabetes and diabetes, even in subjects with AIT classified as being euthyroid, thereby extending the established relation between (sub)clinical hypothyroidism and dyslipidemia in the normal range, especially in subjects with IFG.

No conflict of interest

P-1105

Adherence to protocol during the acute management of diabetic ketoacidosis

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Background: Diabetic Ketoacidosis (DKA) is a hyperglycaemic emergency associated with major morbidity and mortality. Initial management is primarily with fluid resuscitation. It has been shown that treating patients admitted with DKA using an integrated care pathway, or protocol, reduces time taken to initiate management thus optimising care. A new protocol for managing DKA was devised based on current literature and introduced in Sherwood Forest Trust in July 2008.

Aims: To assess whether the trust DKA protocol is being followed at Kingsmill and Newark District General Hospitals during acute management (first 4 hours) of patients.

Methods: Retrospective case note review of all adult patients coded as DKA from July 2008 to February 2009. We reviewed the use of the protocol and extracted information from medical documentation and fluid balance charts.

Results: 57 cases were coded as DKA of which we analysed 46. This was made up of 36 individual patients some of whom had multiple admissions. 78% of patients were correctly diagnosed according to protocol and 68% had a copy of the protocol in their notes. 100% of patients had IV access and correct blood tests within 1 hour of admission. 80% were given appropriate fluid resuscitation within the first hour. 72% had the correct insulin prescribed and 73% were on the correct sliding scale. 78-91% of patients had the correct initial investigations ordered. 89% of patients were managed on the Acute Medical Unit or a specialist diabetes ward as higher level of care was not needed. However only 46% of patients requiring High Dependency Unit care were referred appropriately. 41% had severity documented and 38% had repeat electrolytes checked at 2 and 4 hours. Between hours 2 and 4 only 35-60% of patients had the correct fluid prescribed.

Conclusion: The findings indicated that there was awareness of the new DKA protocol. It was referred to and placed in clinical notes but not always followed. Management of patients with DKA within the first hour was compliant as initial investigations and fluid resuscitation were ordered as per protocol. However, subsequent fluid management and electrolyte monitoring was poor. This may reflect the clinical judgement of the admitting physician, thus emphasising the importance of evaluating each clinical case individually. Unfortunately this was unclear from documentation. Another factor may be inefficient handover when patients are transferred to different wards. There was also poor compliance to the HDU referral criteria. This may be partly due to inadequately defined parameters on the protocol. Therefore, the protocol does help to standardise initial management of patients but further education is needed and referral criteria need clarifying.

No conflict of interest

P-1106

The association of Type 2 diabetes and autoimmune hypothyroidism in an urban setting in Eastern India

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Background and aims: Thyroid disease is common in the general population, and the prevalence increases with age. Hypothyroidism is a recognized risk factor for atherosclerotic cardiovascular disease, hyperlipidemia, low grade inflammation and hypercoagulability.Type 2 diabetes is a major risk factor for atherosclerosis and cardiovascular disease.As diabetes and hypothyroidism are independent risk factors for the same disease process, namely cardiovascular disease, it is possible that patients suffering from both these disease entities may have a compounded risk. Our study is an effort to investigate the proposed association between these two disease entities and to identify the factors that increase the risk of this association.

Materials and methods: A crosssectional study from a tertiary care hospital in Kolkata city, Eastern India. 1485 patients (between 20-70 years of age) attending the Endocrinology & Diabetes clinic were studied between October 2008 till January 2009, for 4 months. 1059 patients had diabetes (624 males, 435 females), 426 (96 males, 330 females) had hypothyroidism only. TSH, FT4 were measured for both the groups using electrochemiluminescence immuno assay. Anti thyroidperoxidase (TPO) antibody was measured in all patients with raised TSH, using enzyme linked immunosorbent assay. 231 patients (93 males, 138 females) had diabetes and hypothyroidism (with positive anti TPO antibody). The baseline characteristics between the groups were compared with Student's t-test. Chi-square test was used to analyze the association between diabetes and hypothyroidism. Logistic regression analysis was applied to identify the association between hypothyroidism and the patient characteristics in the study group.

Results: Of the 1485 patients, 720 were males (48.48%), 765 were females (51.51%) with mean age 46 ± 9.4 years. Of the 1059 patients with diabetes, 435 were females (41.08%), 624 males (58.92%) with mean age 45 ± 11.2 years. Of the 426 patients with hypothyroid only, 96 males (22.53%), 330 females (77.46%), mean age 41± 12.4 years. In the entire group, 231 patients (93 males (40.25%), 138 females (59.74%) had diabetes and hypothyroidism coexisting together. This accounts for 15.56% of the total group having both hypothyroid and diabetes associated together. 2x2 Chi square test was used to look for association of of diabetes and hypothyroidism and the independence value of Chi square was rejected, thereby proving association of diabetes and hypothyroidism. Logistic regression analysis recognized the association between female gender (P = 0.031) and hypothyroidism (P = 0.011) more strongly when compared with males.

Conclusion: Hypothyroidism and type 2 diabetes may coexist together and it would be prudent to screen patients with diabetes for hypothyroidism in order to treat cardiovascular risks more effectively.

No conflict of interest

P-1107

A simple work tool for assessing and following up type 2 diabetic patients

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Introduction: The clinical evaluation and follow-up of type 2 diabetic patients in primary care can be made more simple by using this methodology as a daily work tool in clinical practice. There are very good diabetes guidelines available, however, they are not usually followed by general practitioners. It can be due to lack of time to examine the patients affected by chronic diseases, and this is an important reason to explain why it may be tempting to ignore guidelines in primary care. We must have enough time to use them, and in primary care, each GP has too many patients and few minutes for each.
Aim: To facilitate the clinical assessment of type 2 diabetic patients in primary care, and to optimize the medical resources used in these patients. Using this methodology, we also obtain a cardiovascular risk profile according to which give an individualized treatment. A further aim is to improve the cooperation between general practitioners and a hospital's medical specialists.
Method: This methodology is based on a method that consists of:
1st.- Asking five questions about the clinical process that we are evaluating.
Is hyperglycaemia due to diabetes mellitus? / What type of diabetes is it? / What about systemic and organ damage? In which phase of the disease is the patient now? / What diagnostic tools can we use to evaluate the organ damage? / Which is the optimal treatment for each patient?
2nd.- Following five-steps for patient's clinical assessment. Each step is related to a question, so we have five questions and five steps that we must follow.
3rd.- The steps lead to obtaining five answers. If we have followed every one of these steps, we will have obtained five answers.
Results: These answers are used:
1. To confirm hyperglycaemia.
2. To classify hyperglycaemia.
3. To know the organ and systemic damage, when the patient comes to the doctor's for the first time.
4. To know the cardiovascular risk factors involved.
5. According to these answers the physicians give the patient a individualized treatment.

This methodology makes it possible to detect the correct stage of the disease by:
1st.- Selecting the type of prevention required (primary/secondary).
2nd.- Metabolic control degree.
3rd.- Regulating the therapies employed focussing on possible organ and systemic damage, usually frequent in type 2 diabetic patients.
Conclusions: This work tool makes easier the clinical assessment and follow-up of the type 2 diabetic patient by physicians and nurses in primary care. The usefulness of this methodology is based on:
1st.- Improving the quality of medical care, making GP and nurses work efficiently in daily clinical practice.
2nd.- Establishing a better relationship between general practitioners and hospital's medical staff.

No conflict of interest

P-1108

Evaluation of clinical profiles in relation to the titer of anti-GAD antibodies in patients with diabetes

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Background and aims: Anti-GAD antibodies (GAD) have been widely used for the diagnosis of type 1 diabetes, although the relationship between titer of GAD and clinical phenotype still remains uncertain. The titer of GAD declines depending on the duration of diabetes, but some patients have sustained high titer of GAD. The present study was undertaken to retrospectively investigate the relationships between titer of GAD and clinical parameters.
Methods: Six hundred and fifty-two patients who were measured their GAD during 8 years were enrolled this study. Those patients presented ketosis, rapid deterioration of blood glucose, unstable blood glucose levels, or young onset of diabetes. The GAD was measured by RIA and titer above 1.5U/ml was defined as positive. One hundred and two patients (15.6%) showed positive results. The titer of GAD ranged from 1.5 to 57400 U/ml. Nine patients were excluded, because of age (below 12 years old), under hemodialysis, or pancreatic and renal transplantation. The GAD-positive patients were arbitrarily classified into four groups by titers as low (L:1.5-9.9U/ml), middle (M: 10-99U/ml), high (H: 100-999/ml), and extraordinary high (EH: >1000U/ml).
Results: The prevalence rates in each group among GAD-positive patients are 36.6% for L, 41.9% for M, 15.0% for M, and 6.5% for EH, respectively. There is no significant difference among age, HbA1c, dose of insulin at the time of measurement. The titer of GAD in EH declined but still remained high values. On the contrary, three cases increased the titer (L to M, M to H, and M to EH). There is no relation between the titer of GAD and the duration from the onset of diabetes to the introduction of insulin therapy. The basal values and increment of serum CPR after glucagon stimulation test are not statistically different among each groups. The prevalence of complication such as autoimmune thyroid disease is significantly high in EH ($p<0.05$). The prevalence rates of diabetic complications are not different among each group. Eighteen percent of L group are treated with oral agents without insulin, and other groups are all treated with insulin ($p<0.05$).
Conclusion: High titer of GAD are closely associated with other autoimmune disease such as thyroid disease, but not related to insulin requirement or diabetic complications, suggesting heterogeneity of GAD.

No conflict of interest

P-1109

Hyperglycemia among patients coinfected with HIV and Hepatitis C Virus

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Objectives: To ascertain the prevalence of hyperglycemia among patients coinfected with HIV and hepatitis C virus (HCV) who had been taking antiretroviral therapy (HAART).
Material and Methods: A cross-sectional descriptive study was conducted with 213 HIV patients attending Beneficencia Portuguesa Hospital, Sao Paulo, Brazil. Two groups of patients were considered: Eighty-seven HIV/HCV coinfected patients were compared with 126 HIV-monoinfected patients. Inclusion criteria were HCV-RNA positive and a sustained increase of aspartate aminotransferase (AST), alanine aminotransferase (ALT) and gamma-glutamyl transferase (GGT) of at least twice the normal value. Our data also included clinical variables as age, gender, body mass index (BMI) and percutaneous liver biopsy. Hyperglycemia was defined as a fasting plasma glucose (FPG) >110 mg/dL.
Results: The median age for HIV/HCV group was 44±12 vs 39±9 years in HIV group. Blood glucose level, GGT, ALT in the HIV/HCV group vs. HIV group were respectively 95±74 vs. 96±33mg/dl ($p= 0.17$), 99.24±132 vs. 52.18±76.44 UI/l ($p=0.0001$), 68±62 vs. 55±94 UI/l ($p=0.0001$). Although HOMA IR was not different (2.35 vs 2.41, $p =0.88$), the prevalence of hyperglycemia was higher in the HIV/HCV group (12 vs 5%, $p=0.004$). The median duration of combination antiretroviral therapy was 57±28 months. Eight-two percent taking HAART, 9.7% naive and 8.3% stop the antiretroviral treatment. The injury liver was found in 58 % patients HIV/HCV group vs 24% HIV group ($p< 0.005$). In the HIV/HCV group, older age (OR: 1.03, 95% CI 1.01 – 1.08), longer duration of HAART (OR: 1.02 95%CI 1 – 1.03) and liver injury (OR: 2.46 95%CI 1.16 – 3.56) are related with hyperglycemia. There was no difference between HIV/HCV and HIV groups in BMI, CD4+ cell, gender.
Conclusion: Our findings suggest that older age and liver injury are significant factors associated with the development of hyperglycemia in HIV/HCV patients receiving antiretroviral treatment for long time. Further studies on the cofactors such as family history of type 2 diabetes, HCV genotype and viral replication are needed to clarify the exact role of HCV infection in the induction of this metabolic disorder.

No conflict of interest

P-1110

A prospective observational intention to treat study on glycaemic management in patients receiving steroids

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Introduction: Steroids are used for many different medical disorders. Abnormal glucose metabolism induced by steroids may cause both fasting and postprandial hyperglycaemia or worsening of preexisting diabetes. It is

important to monitor blood sugar levels in patients taking steroids. In this study, we try to find out which Insulin regimen is better in managing steroid induced/worsened diabetes.

Aim: We aim to assess the glycaemic control with different insulin regimens using both regular and analogue insulin.

Materials and methods: Patients male or female who received steroids more than three times the replacement dose, with a fasting sugar more than 126 or a random sugar more than 200 mg/dl were included in this study. Patients were allocated to any one of the four insulin regimens, namely: A - Modified basal bolus regimen, B - true basal bolus regimen, C- three premix regular insulin and D - three premix analogue insulin. In all patients glucose monitoring was done both premeal and 2hr postmeal. In addition to this sugars were monitored for hypoglycaemia. Target was to achieve a premeal between 80-140 and postmeal between 120-180 mg/dl.

Results: A total of 40 patients were included. Baseline characteristics were identical in all the four groups, with the mean age being 61 years, 3 in each group were new detection of high sugars; average HbA1c in those with preexistent Diabetes was 6.6%. Average steroid dose each patient received was the equivalent of 100mg prednisolone/day. In all the four groups (same order as mentioned earlier) average fasting sugar was 185, 147, 201 and 155 respectively; average premeal sugar was 206, 181, 270 and 165 while average postmeal was 268, 234, 380 and 222 respectively. Insulin requirement (short and long acting) in each of the four regimens were as follows: 29 and 28, 39 and 35, 33 and 46, 20 and 26 units. 44% of our patients on regimen B and 60% in regimen D achieved target pre and postmeal sugars in comparison to none in the other two regimens. One each in A and C regimen were upgraded to D regimen with persistent high sugars. 3 patients in A, B and D regimen developed hypoglycaemia, fortunately all were mild and managed easily.

Conclusion: Steroid Diabetes is a challenge to the treating physicians. Though our cohort was small, yet we find that analogue insulin seem better in controlling sugars. We need to try this in a bigger cohort to see the response.

No conflict of interest

Monitoring of blood glucose control

P-1111

Perioperative glycaemic control: sliding scale versus glucose potassium & insulin infusion

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Surgery in the diabetic population is linked with an increased risk of surgical complications, especially wound infections, and can cause increased length of stay in hospital. It is estimated that 50% of patients with diabetes will undergo surgery at some point in their lives.

Aim: This audit looked into perioperative glycaemic control and aimed to determine whether the use of glucose, potassium and insulin (GKI) infusions or use of sliding scales (SS) resulted in better glycaemic control, and which was preferred by staff. National guideline adherence was to be determined, and we aimed to make recommendations for a new hospital policy. Staff preferences were discovered by use of questionnaire.

Method: In this prospective audit, 36 diabetic patients undergoing surgery were selected. The first three preoperative BMs, intraoperative BM and first three postoperative BMs were collected for each patient, with type of surgery, HbA1c, and whether they were on GKI, SS or neither perioperatively.

Results: The GKI regime caused a 24.4% increase in postoperative BMs, SS had a 4.7% decrease, and those on neither showed a 16.4% decrease in BMs. There were no national or local guidelines to recommend either regimen, hospital guidelines were found from another trust, and were used for this audit. Questionnaire showed that 60% of staff preferred SS, compared to 40% GKI, but this did not reflect prescribing, where SS was only prescribed in 20% of patients.

Conclusions: The sliding scale offered the greatest degree of BM control compared to the GKI. National guidelines are needed to better control perioperative glycaemic control to reduce postoperative complications and length of stay. Prescribers need to be educated on the indications for, and correct use of GKI and SS, and standardised treatment should be indicated.

Recommendations: Re-audit with increased number of patients, staff education, national/local guideline development to standardise practice.

No conflict of interest

P-1112

The effect of improved periodontal health on metabolic control in type 2 diabetic patients attending national institute of diabetes in Cairo

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Objective: The aim of the present study was to evaluate the effect of improved periodontal health on the metabolic control in type 2 DM patients.

Subjects and methods: One hundred patients with type 2 DM were selected and assigned into two groups treated group and control group or untreated group.

Data collection: Plaque index (PI), gingival index (GI), probing pocket depth (PPD) and bleeding on probing (BOP) were recorded at baseline and 3rd month. Fasting plasma glucose (FPG), 2-h post-prandial glucose (PPG), glycated haemoglobin (HbA1c), total cholesterol (TC), triglyceride (TG), HDL-Cholesterol and LDL-Cholesterol were analysed at baseline, 3 months after periodontal therapy.

The treatment group received full-mouth scaling and root planing whereas the control group received no periodontal treatment.

Results: A statistically significant effect could be demonstrated for PI, GI, PPD and BOP for the treatment group. HbA1c levels in the treatment group decreased significantly while the control group showed a slight but insignificant increase in this parameter.

Conclusion: The results of this study showed that periodontal treatment associated with improved glycemic control in type 2 patients.

No conflict of interest

P-1113

Perception of clinical usefulness and relevance of a novel diabetes risk stratification tool by clinicians

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Background and aims: Blood Glucose (BG) Variability, a measure of a person's hypo and hyperglycemic excursions over time, was identified by the Diabetes Control and Complications Trial (DCCT) as a good predictor of Diabetes complications[1].

Out of the methods used to measure BG Variability, only a few are sensitive to both hypo and hyperglycemic events. One of them is ADRR (Average Daily Risk Range), an algorithm developed by Kovatchev et al from U. of Virginia that computes an index and risk group from Self Monitoring Blood Glucose (SMBG) data and is highly correlated with the incidence of Diabetes complications[2].

Our aim was to assess the clinical usefulness and relevance of the ADRR algorithm to estimate BG Variability in patients with Diabetes in a clinical setting, utilizing proprietary software.

Materials and methods: 28 participants with Diabetes and 3 Endocrinologists in 2 sites were included in the study.

We built a software application for the study, the ADRR Glycemic Variability Calculator (ADRR-GVC), which uses ADRR to compute the index and risk group from SMBG and presents them to physicians using bar charts to help them observe BG Variability trends.

Participants attended 3 visits (days 0, 30 and 60), during which physicians used ADRR-GVC as described, and then answered a survey containing 5 questions on the clinical usefulness and relevance of ADRR, plus one optional free-text comment.

The questions were scored ("Acceptable" if lower 90% confidence limit was at least 70%, "Not Acceptable" otherwise), and aggregated. The comments were qualitatively analyzed to extract meaningful trends.

Results: 24 out of the 28 participants completed all 3 visits.

All questions were graded as "Acceptable", indicating a high level of acceptability of the system by the physicians in terms of clinical usefulness and relevance.

Physicians perceived a much higher clinical value from ADRR during the second and third visit, specifically for the ability to use ADRR as a quantitative index to assess improvement or worsening of glycemic control between visits, and also found it useful to better understand the patient's BG trends over time and in educating patients on their diabetes management.

Conclusions: The ADRR algorithm is an important risk stratification tool that offers clinically meaningful information to physicians with patients who regularly perform SMBG.
The more time physicians use ADRR with patients the more value they get. It is an effective method to assess improvement or worsening of glycemic control, to understand patient's glycemic trends, and as an educational aid to explain trends to patients.
Given the small sample size it may be advisable to conduct further studies in a larger population to confirm results.
[1] Diabetes 44:968 –983, 1995
[2] Diabetes Care 29:2433–2438, 2006

Conflict of interest:
Employee: Cheryl Pegus, Chief Medical Officer at SymCare

P-1114

Are glucometers sensitive enough to detect hypoglycemia?

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Aim: Self monitoring of blood glucose is essential in the follow up and management of patients with diabetes mellitus. The results given by these devices are in accordance with those of the reference laboratories in normoglycemic conditions. However, we observed that some of the devices are not sensitive enough to establish hypoglycemia. Thus, we designed a controlled study to evaluate the sensitivities of different brands of glucometers in detecting hypoglycemia.
Methods: Twenty five healthy volunteers (22M/3F, mean+/-SD; age: 23+/-2.2 yrs, body mass index: 24+/-3.1 kg/m^2) were enrolled in the study. None of the subjects had any acute or chronic condition that may confound the study results. Five different devices, commonly used in daily practice (Optium Xceed, Contour TS, Accucheck Go, Smart, One Touch Select), were supplied by the manufacturers. Hypoglycemia was induced by bolus injection of 0.1 Unit/kg body weight of regular insulin from the antecubital venous catheters. The readings with the glucometers were performed in the venous and the fingertip capillary blood samples, simultaneously. To validate the results of the glucometers, the venous blood samples were collected in EDTAK2 /sodium fluoride vacuum tubes and analyzed in the reference laboratory. All subjects gave informed consent and the local ethical committee of Gulhane School of Medicine approved the study.
Results: A total of 23 readings were obtained in hypoglycemia and 29 readings in normoglycemia. The glucose determinations either venous or capillary were not statistically different in normoglycemia. The readings performed in hypoglycemia (36.5+/-9.9, 38.3+/-9.7, 39.9+/-9.1, 51.1+/-7.6, 47.0+/-10.3 mg/dL, respectively) were significantly different when compared to those of the reference laboratory (30.2+/-9.9 mg/dL, p<0.01, ANOVA).
Discussion/conclusion: The results of the present study show that the commercial glucose measuring devices may give inaccurate results in hypoglycemia. Therefore, health providers involved in patient care must pay more attention to the symptomatology of hypoglycemia than the values obtained by the glucometers.

No conflict of interest

P-1115

Current practices and utilization of blood glucose test strips in Canada

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Aims: The objective of this work was two fold: 1) investigate the current utilization patterns of blood glucose test strips in Canada; and 2) evaluate the current practices and beliefs of Canadian healthcare professionals and patients with respect to self-monitoring of blood glucose (SMBG).
Methods: Current utilization patterns were assessed using a retrospective analysis of administrative claims data from publicly and privately funded drug plans in Canada. The current practices of physicians (n = 43), pharmacists (n = 19), diabetes educators (n = 18) and patients (n = 40) were evaluated in a series of 20 focus groups conducted in Ottawa, Vancouver, and Edmonton. The responses of health care professionals and patients were collected and a thematic analysis was performed.
Results: Our current utilization analysis has demonstrated that the usage of blood glucose test strips varies by therapeutic regimen. For both publicly and privately funded drug plans, insulin users had the highest mean frequency (± SD) (2.76 ± 3.71 strips/day for public; 3.18 ± 2.70 strips/day for private) and patients using no antidiabetes pharmacotherapy had the lowest (0.99 ± 1.46 strips/day for public; 0.69 ±1.95 for private). Patients using oral antidiabetes agents (without insulin) are the largest users of blood glucose test strips (52% of claims) for the publicly funded Ontario Drug Benefit Program; whereas, patients using insulin (without oral antidiabetes agents) account for the largest proportion in the privately funded drug plans (40% of claims).
Our current practice analysis demonstrated that the vast majority of physicians recommend SMBG to their patients and that most patients are compliant with the recommendation. The focus groups also revealed an important divergence in the views of heath care professionals and patients with respect to reviewing glucometer results. Health care professionals indicated that they reviewed SMBG results with their patients, but most patients reported that their physician based treatment decisions on glycosylated hemoglobin test results and typically ignored SMBG results.
Discussion/conclusion: Despite testing at a lower daily frequency than insulin users, patients not using insulin currently account for the largest users of blood glucose test strips. The increasing prevalence of type 2 diabetes may further increase usage of blood glucose test strips. Physicians recommending SMBG should clearly establish the role that SMBG results will play in the therapeutic decision making process with their patients.

No conflict of interest

P-1116

Application of ADRR combination with HbA1c for evaluation of SMBG performance in diabetes

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Aims: Recent studies showed that the ability of patients to tightly control their glycemic variation may become a paramount task of diabetes management. Glucose variability, considered in combination with A1c, may be a more reliable indicator of blood glucose control and the risk for long-term complications than A1c alone, and a good prediction performance of the measure for diabetes called the average daily risk range (ADRR) has been demonstrated. It is therefore important to evaluate the application of ADRR in health education performance from routine self-monitoring blood glucose (SMBG) task.
Methods: 28 patients (14 men, 14 women, 16 Type 1 DM, 12 Type 2 DM) were enrolled consecutively into the trial. The age of patients ranged from 24 to 98 years, and had an average duration of diabetes of 12.4 years (ranging from 1 to 27 years). Metabolic control values of diabetes were considered good or poor according to whether HbA1c levels were <7.0 or >8.0%, respectively. When HbA1c was between 7.0 and 8.0%, the patients were considered as fair metabolic control. The ADRR is computed from the continuous 5-month SMBG data for each patient.
Results: 11 of 28 patients were selected as good metabolic control based on initial HbA1c values less than 7.0. The mean A1c values at initial, 3rd month and 6th month were 6.0, 6.1 and 5.9%, respectively (P = 0.843). The mean ADRR by month of the 11 patients were changed from 14.33 to 17.09 during the continuous 5 months SMBG educational trial. Furthermore, 4 of 28 patients were selected as fair control group with mean A1c values at initial, 3rd month and 6th month were 7.5, 8.1 and 8.6%, respectively (P = 0.367). The mean ADRR by month were changed from 37.66 to 33.44. However, significant improvement (9.9 to 7.4%) of A1c values in 13 patients of poor control group were observed (P = 0.007), and the mean ADRR by month were steadily kept moderate from 24.35 to 24.88 during the 5 months SMBG program.
Conclusion: Our study introduces that ADRR values were used to evaluate the variability of daily blood glucose and the performance in SMBG health education. Patients with different metabolic control status in HbA1c levels before trial would represent improved consequences after the SMBG trial durations if the ADRR values indicated as low risk. In this study, we found that not all patients represent improved consequences after the SMBG trial

durations. Significant reduction in A1c levels was exhibited in patients with poor metabolic control status. These patients showed steady maintenance of ADRR values during the trial implies the importance in control of habitual medication and diet, and would represent by routine measured ADRR values for glycemic variability evaluation in SMBG program. The regular feedback of ADRR to patients and their clinicians would result in improvements in glycemic control.

No conflict of interest

P-1117

Dyslipidemic peculiarities in patients with diabetes mellitus

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Objective: Study of carbohydrate metabolism compensation level and lipidoses in patients with T1DM.
Materials and methods: Total 726 patients with T1DM (348m, 378f), mean age (M±s) 34,71±0,58 yrs (1-78), age of T1D manifestation 12,41±0,36 yrs and special form including questions about T1DM. Levels of triglycerides (TRIG), total cholesterol (CHOL), high density lipoprotein (UHDL), low density lipoprotein (LDL), very low density lipoprotein (VLDL), $HbA1_c$(%) were measured by biochemical analyzer 'ARCHITECT c8000' (Abbott, USA).
Results: The data on indicators of age-sex composition, body mass index (BMI), systolic blood pressure (sBP), diastolic blood pressure (dBP) are presented in Table 1.

Age groups	Age, years	N (number)	Female/ Male	BMI, kg/ m^2	sBP	dBP
					mm Hg	
I	1–9	25	16/9	16,19	99	62
II	10–13	48	20/28	17,87	104	66
III	14–17	57	28/29	20,16	103	70
IV	18–39	309	167/142	23,79	121	79
V	40–59	257	127/130	27,59	135	85
VI	over 60	30	20/10	30,06	151	83
Total	total	726	378/348	24,46	124	79

It was noticed that patients above 40 years have overweight and obesity, and systemic hypertension.

Indicator	Patients	Control	p
	M±m		
$HbA1_c$ %	8,95±0,08	5,13±0,02	0,0001
CHOL, mmol/l	4,85±0,04	4,78±0,08	0,386
TRIG, mmol/l	1,39±0,05	1,08±0,06	0,0001
VLDL, mmol/l	0,63±0,02	0,48±0,03	0,0001
UHDL, mmol/l	1,49±0,02	1,41±0,02	0,071
LDL, mmol/l	3,28±0,57	3,01±0,06	0,0001

The difference of TRIG (p<0,001), VLDL (p<0,001) and LDL (p<0,001) indicators in patients with T1DM is obvious in comparison with healthy people. At division of the groups by sex, the levels of CHOL (4,21±0,14) and TRIG (1,49±0,08) are higher in sick men than in men without T1DM with CHOL (3,59±0,15; p<0,05) and TRIG (1,14±0,1; p<0,05); the levels of TRIG (1,29±0,05) and LDL (3,89±1,1) are higher in sick women than in the comparison group with TRIG (1,04±0,08; p<0,001) and LDL (3,1±0,08; p<0,001). The general growth of CHOL, TRIG and LDL indicators was noted in both groups with the age, and the growth of indicators in women is more obvious. The patients of all age groups have unsatisfactory compensation of T1DM by the level of $HbA1_c$: MAX in III (10,25±0,3%), and MIN in VI (8,52±0,33; p=0,0001), and $HbA1_c$ is higher in men of younger age group (I - 8,91±0,64%; II - 10,16±0,45; III - 10,54±0,44%) than in women (I - 8,76±0,65%; II - 8,87±0,4; III - 9,94±0,4%; p<0,05) with decrease to MIN in men of senior age group (VI - 7,4±0,4%, V - 8,33±0,18%) in comparison to women (VI - 9,08±0,4%, V - 8,79±0,16%; p<0,05). We got the direct dependence of $HbA1_c$ level on the level of CHOL (r=0,133 is received; p=0,001), TRIG (r=0,188; p=0,001) and LDL (r=0,166; p=0,001) under the correlation analysis.
Conclusion: Cholesterol exchange indicators of the patient group with T1DM differ from the ones of the comparison group in the form of atherogenic fractions increase of CHOL (p=0,386), TRIG (p=0,001), VLDL (p=0,001) and LDL (p=0,001). $HbA1_c$ figures show unsatisfactory compensation of T1DM in all age groups; however, in men the indicator improves with the age and statistically significantly correlates with atherogenic lipid indicators.

No conflict of interest

Nutrition and diet

P-1118

The effect of partial meal replacement therapy on weight loss and glycemic control in obese individuals with type 2 diabetes

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Background and aims: Approximately 80 to 90% of people with type 2 diabetes are overweight or obese. Weight loss of 5 to 10% of body weight, has been shown to improve glycemic control. According to the Canadian Clinical Practice Guidelines on the Management and Prevention of Obesity in Adults, meal replacement therapy may be considered as a component of an energy-reduced diet. The aim of this study was to examine weight and treatment changes in obese individuals with type 2 diabetes using meal replacement as part of a calorie reduced diet.
Methods: We retrospectively studied a cohort of obese individuals with type 2 diabetes who commenced a calorie reduced diet which included liquid meal replacements, and who followed this program for at least 3 months between March 2006 and March 2008. Individuals were instructed by a registered dietitian to include 2 cans of Glucernaä per day (each can provided 230 kcal, 30 g carbohydrate, 11 g protein, 8 g fat) as part of a 1200 to 1400 calorie diet.
Results: 47 obese individuals with type 2 diabetes (20 males, 27 females; mean age: 60 ± 8.8 yrs; mean weight: 115.4 ± 22.4 kg; mean BMI: 40 ± 6.4kg/m^2; mean $A1_{C:}$ 7.6±1.5%) were assessed before and at 3 monthly intervals after starting partial meal replacement. Diabetes therapy included: diet only (43%); oral agents only (29.8%); insulin only (25.5%); and insulin + oral agents (40.4%). In 66% on insulin, the mean baseline daily dose was 156 ± 95 units. Individuals followed the program for a mean of 11.4 ± 4.1 months. 34% of people withdrew after a mean of 9.7 ± 3.7 months. Compared to baseline, mean weight change at 3 months was – 3.4 ± 3.3 kg (p<0.001) and at 6 months was – 6.1 ± 14.4 kg (p<0.005); mean $A1_c$ change at 3 months was – 1.0 ± 1.8 % (p< 0.01) and at 6 months was – 1.2 ± 2.1 % (p< 0.05); and mean insulin dose change at 3 months was –24.1 ± 38.3 units (p< 0.005) and at 6 months was – 27.7 ± 44.1 units (p< 0.005).
Conclusion: Partial meal replacement therapy can achieve significant weight loss and improvement in glycemic control at 3 and 6 months. The high attrition and non-adherence rates suggest that it may be a viable short term option to stimulate weight loss while transitioning to a lifestyle program which incorporates healthy eating, physical activity and behaviour change to attain a healthy weight.

No conflict of interest

P-1119

Weight status, nutrient intakes and food choices in type 1 diabetic children with carbohydrate counting meal plans

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Aims:
1. To assess prevalence of overweight and obesity in a sample of type 1 diabetic children with carbohydrate counting meal plans, and
2. to compare nutrient and dietary intakes according to insulin regimen and to level of carbohydrate counting (basic level = consistency in day-to-day carbohydrate intake and in meal insulin doses; advanced level = variable carbohydrate intake with adjustment in meal insulin doses using carbohydrate to insulin ratios).

Methods: 70 type 1 diabetic children aged between 6 and 12 years took part in this study; 42 were on multiple daily injections (MDI) and 28 were on insulin pump. Body weight and height were recorded in all subjects and two 24-h dietary recalls were completed in 67 of them. Prevalence of overweight and obesity was assessed based on international body mass index (weight/height^2) cut-off points. Food recalls were analysed for nutrient intake and for number of food exchanges ingested on a daily basis.
Results: Prevalence or overweight and obesity was very similar to that observed in the general Quebec youth population, as 78.6% of diabetic subjects were not

overweight (versus 77.4% in the general population), 15.7 % were overweight (versus 15.5%) and 5.7% were obese (versus 7.1%). Nutritional analysis of food recalls showed that mean daily energy intakes and % kcal for protein were significantly lower in children on insulin pump than in those on MDI. With the latter, when comparing numbers of food exchanges according to the level of application of carbohydrate counting, it was found that diabetic children at the basic level consumed more milk and substitutes (3.8 ± 1.7 exchanges/day, mean ± SD) than children at the advanced level (2.7 ± 1.1, $p < 0.05$). The opposite was noted for meat and meat substitutes (4.2 ± 1.9 exchanges/day for basic level, 5.7 ± 2.3 for advanced level, $p<0.05$). Numbers of exchanges were similar for basic and advanced level of carbohydrate counting for foods of the starch group (6.6 ± 1.8 and 7.1 ± 1.7), fruit group (2.4 ± 1.9 and 3.2 ± 1.6), vegetable group (1.6 ± 1.3 and 1.5 ± 1.2), fat group (6.4 ± 3.3 and 7.8 ± 2.9) and foods with added sugar (3.0 ± 2.2 and 3.3 ± 1.7).

Conclusion: According to these results, a flexible meal plan focusing on carbohydrate counting does not seem to lead to overweight or obesity in type 1 diabetic children. Although advanced level of carbohydrate counting could theoretically allow for larger intakes of food or poorer food choices, this was not observed in the present study.

No conflict of interest

P-1120

Pilot study demonstrates promise for dietary counseling-cooking lesson intervention in type 2 diabetes

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Aims: Among adults with type 2 diabetes in Montreal, we sought to assess the feasibility and potential effectiveness of dietary counseling combined with cooking lessons to achieve weight loss and cardiovascular risk factor control in type 2 diabetes.

Methods: Pilot single-arm interventional study wherein 35 adults with type 2 diabetes participated in a group cooking class approximately once every two weeks over 16 weeks. Lessons were led by a chef who led participants through recipes selected by the research team from a recipe book endorsed by the Canadian Diabetes Association. The intervention was conducted at the kitchen workshop of a local grocery store (Loblaw's) that is normally used for birthday parties. Lessons were hands-on and ended with participants eating together and discussing dietary principles with a registered dietitian. All participants underwent evaluation prior to and following the intervention. Outcomes assessed included weight, BMI, glycemic control, blood pressure, and dietary intake. Participants were recruited through McGill University-affiliated clinics and local advertisement at the McGill University Health Centre.

Results: Approximately 60% were women, 60% Canada-born, and 75% were White. Mean age was 59.6 years (SD 9.8), mean baseline BMI was 32 kg/m2 (SD 6.0), mean A1C 7.2% (SD 1.4), blood pressure 131 (SD 13.6)/82 (SD 8.7) mm Hg, and waist to hip ratio 0.9 (SD 0.09). Among the 35 participants enrolled, 33 completed the intervention and outcome assessments at approximately 20 weeks from the first visit. There were significant changes post intervention in BMI (-0.63 kg/m2, 95% CI -1.0 to -0.3), and weight (-1.7 kg, 95% CI -2.5 to -0.90). No significant changes in blood pressure, A1C, or waist to hip ratio were detected at 20 weeks. Among the 33 participants who remained in the study, all attended at least 75% of the sessions.

Discussion: We have demonstrated that an eight lesson program of group cooking lessons combined with dietary counseling is a feasible strategy that is well-received by participants. The intervention was associated with significant reduction in BMI. We are presently testing the impact of longer programs (15 lessons; 18 lessons) combined with a pedometer-based walking intervention to see if we are able to achieve higher levels of weight loss and greater impact on glycemia and blood pressure.

No conflict of interest

P-1121

Impact of plant sterols, fish oil omega-3s and their combination on blood glucose in Indian adults

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Aims: Observational studies suggest greater risk of coronary heart disease in those with higher fasting blood glucose (FBG). Whereas many studies have examined the impact of dietary supplements on lipid profile, few have described the effect of plant sterols and/or omega-3s (w-3s) supplementation on FBG. We compared the independent and combined effects of a yoghurt drink providing 2 g/d plant sterols and fish-oil capsules providing 2 g/d w-3s on FBG in Indian industrial workers.

Methods: Following a 2-week run-in period, 200 mildly hypercholesterolemic (Total Cholesterol 5.0-8.0 mmol/L) adults aged 35-55 years, were randomized into one of four groups of a 2 x 2 factorial, double-blind, placebo-controlled trial. 178 subjects provided blood samples before and after the 4-week intervention. FBG levels were analyzed (quasi Intention-to-treat; n=178) using analysis of covariance (ANCOVA) models with relevant baseline measurements as covariates; adjusted means were compared across groups.

Results: There were no significant differences in the baseline FBG concentrations of the four treatment groups (Range: 106.7 to 115.4 mg/dL). The adjusted means for FBG were 111.4 (Confidence Interval: 107.7 – 115.0), 108.8 (104.9 – 112.7), 105.8 (102.2 – 109.5) and 110.3 (106.6 – 114.0) mg/dL for the control, w-3 alone, plant sterols alone and combination group respectively, indicating a 5 percent non-significant decrease in FBG concentrations of the subjects receiving plant sterols alone compared with the placebo group.

Conclusions: The trial results suggest that there are no significant short-term negative effects of supplementing either plant sterols and/or fish oil w-3s on the FBG concentrations of dyslipidemic Indian industrial workers. More studies in this area are warranted.

No conflict of interest

P-1122

Changes of plasma free amino acids in type 2 diabetic patients

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Background and aims: The aim of this study is to investigate the alterations of plasma free amino acids (AAs) in T2DM patients so as to provide some valuable information for further clinical high protein diet researches.

Subjects and methods: A total of 132 Type 2 diabetic patient and 137 age, sex, cigarette and alcohol use matched healthy controls are included in this study. All of them have no history of severe disease such as pulmonary, heart, liver and kidney diseases. Dichotomous data were described as percent (%). Continual data with normal distribution or near normal distribution was described as mean ±S.D., others were described as median and quartiles and were transformed as "Ln" for statistical analysis. Categorical variables were compared by chi square tests. Continuous variables were evaluated by Student's t tests. Correlations between analyzed by Pearson test. All reported P values are two tailed, and those $\alpha<0.05$ were considered statistically significant.

Result: Levels of total plasma free AAs, essential AAs and branched chain AAs in T2DM patients are higher than those in controls (P=0.000 for all). Non-essential AAs' level is also high in T2DM patients but with marginal significant difference (P=0.044). Statistic results of individual AAs show that plasma alanine, valine, leucine, isoleucine, phenylalanine, tyrosine, methionine, glutamic acid and lysine are higher in T2DM than in control (P<0.01 for all),

while plasma glycine, glutamine are lower in T2DM than in control (P=0.003 and P=0.034 respectively). Further analysis show that total plasma free AAs, especially essential AAs and branched chain AAs, are strongly associated with BMI, Waist, GGT, UA, Ferritin, ALT, TC and TG. Alanine, valine, leucine, isoleucine, phenylalanine, tyrosine, methionine, glutamic acid and lysine are positively correlated with BMI, Waist, GGT, UA, Ferritin, ALT, while, glycine and glutamine negatively associated with BMI, Waist, GGT, Ferritin, ALT.

Conclusion: There are significant differences in plasma AAs quality and quantity between T2DM patients and controls. Some AAs, especially essential amino acids and branched chain amino acids are correlated with identified T2DM risk factors. Whether or not there exists a causative relationship between plasma AAs changes, T2DM risk factors and T2DM is very necessary to be further investigated.

No conflict of interest

P-1123

Optimizing diabetic control with a low glycemic index diet

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Aims: Cross-sectional studies suggest that postprandial hyperglycemia had a greater contribution than fasting hyperglycemia in attaining HbA1c goals, especially for those patients with an A1c below 10%. We hypothesized that subjects who started with low level of HbA1c and treated with low GI diet would have larger improvement in glycemic control than their counterparts treated with conventional diet. This is important in the present context because low GI diet is meant to reduce postprandial hyperglycemia. Therefore, we examined whether based on their HbA1c level at entry into our dietary intervention study would result in any differences in HbA1c levels at the end of the 12 week period.

Methodology: We undertook a prospective, parallel, randomized intervention study to assess the effectiveness of low GI diet (GI) vs. conventional carbohydrate exchange (CCE) dietary advice on glycemic control in patients with type 2 diabetes over a 12-week period. A total of 100 subjects (age=56.4±9.9 years; 37% male; years of diagnosis= 6.3±4.9 years), treated with diet or on a stable dose of medication were enrolled in the dietary intervention program. In this secondary analysis, subjects from the GI (n=51) and CCE (n=49) groups were sub-divided according to their starting levels of HbA1c of either less or more than 8%, a criterion used by major clinical diabetes study.

Results: At week 12, HbA1c level declined to a lesser degree on a low GI diet (-0.51%) than on a conventional carbohydrate exchange (-0.29%) dietary advice. The intervention failed to detect any absolute differences between the two groups but the mean changes from baseline for subjects who started with lower HbA1c level (<8%) were significantly greater in the GI than in the CCE group (-0.4% ± 0.1 vs. +0.1 ± 0.1%; p< 0.05).

Conclusions: In type 2 diabetes patients whose HbA1c is close to target (HbA1c between 7-8%), the introduction of a low GI diet is able to further reduce the HbA1c. The result is interesting and seems to fit a priori hypothesis that low GI diets are meant to reduce postprandial hyperglycemia.

No conflict of interest

P-1124

Effect of Ramadan fasting on anthropometric parameters and on food consumption in 276 type 2 diabetic obese women

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Aims: To assess the effect of Ramadan fasting on body weight and food consumption in type 2 diabetic obese women.

Methodology: Two hundred and seventy six (276) outpatient women receiving oral antidiabetic drugs (OADs) (BMI=34.63±3.29 kg/m2), aged 49 (±6 years), were selected. The study was carried out over 3 periods - before (T1: pre-fasting), during (T2: fasting), and after (T3: post-fasting) Ramadan - in 3 towns located in the Northwestern region of Algeria. During the course of 3 days, we first recorded the daily food intake, and then we measured as anthropometric parameters weight, height, waist and hip circumferences, body mass index (BMI) and waist-hip ratio (WHR). A one-way ANOVA test was used to compare the groups.

Results: The main effect of fasting during Ramadan was a significant weight loss ($P < 0.01$), a decrease in meal frequency (2.2±0.3 vs. 4.3±0.4) as well as in energy intake (-209 Kcal/d), and an important increase in dietary fat consumption (35.84% of total calories), especially the saturated one (43.33% of total fat), dietary cholesterol (392±121 mg/d), and polyunsaturated fatty acids (PUFA). Except for three cases, there were no frequent hypoglycaemia episodes observed among the participants.

Conclusions: Fasting during the month of Ramadan causes weight loss and decrease in calorie intake which is correlated with a decrease in meal frequency. However, more foods rich in fat and dietary cholesterol were consumed during this period. The latter could constitute a high risk for diabetics who are fasting, in particular when medication advice and/or health care control are insufficient or ignored.

No conflict of interest

P-1125

Trace mineral status and glycaemic control in Nigerians with type 2 DM

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Background: Trace minerals have been implicated in the metabolism of glucose and glycaemic control but there is no documented study of a Nigerian population.

Aims: The objective is to evaluate serum chromium and zinc status in patients with type 2 DM and correlate this with glycaemic control.

Patients: Persons with type 2 DM attending the DM clinic of the University of Benin Teaching Hospital, who met the inclusion criteria, were recruited with informed consent. Proteinuria, hypoproteinaemia and pregnancy were exclusion criteria.

Methods: The study was cross sectional in design. Questionnaires were administered to subjects to obtain socio-demographic information. Subjects had a detailed physical examination, and blood was collected for FBG, serum lipid profile, serum chromium and zinc, HbA1c, serum urea and creatinine after an overnight fast of 8-10 hours. The SPSS statistical software was used for analysis. Differences were significant when p-value was = 0.05. Person's moment correlation was used to correlate the different variables with zinc and chromium.

Results: 120 persons, age and sex matched were studied. The mean (±SD) age was 54.0 (±7.4) years, males 54.4 (±7.8) years and females 53.7 (±7.1) years. The mean (±SD) duration of diabetes was 4.3 (±4.0) years, range = 1-23 years, males 3.7 (±3.7) years, range 1-17 years and females 4.9 (±4.3) years, range 1-23 years. The mean (±SD) BMI was 29.8 (±5.1) kg/m^2, males 30.1 (±4.6) kg/m^2 and females 29.5 (±5.6) kg/m^2.

The prevalence of hypertension was found to be 61.7%, while the prevalence of chromium deficiency was 66.7% and that of zinc was 60%. The mean (±SD) serum level of chromium was 0.4 ±0.2mcg/L. The mean (±SD) FBG was 159 (±79) mg/dl. The mean (±SD) HbA1c was 8.8 (±2.7) %. A total of 40.7% of subjects had FBG <126mg/dl and 59.3% ≥126mg/dl. 157 (37.4%) had HbA1c <7%, and 62.6% had HbA1c ≥7%. Serum chromium level correlated inversely with FBG and HbA1c, unlike the serum concentration of zinc which had no significant correlation with FBG and HbA1c.

Discussion: Chromium is a cofactor in the action of insulin and it potentiates the action of insulin. This may account for the inverse relationship between serum chromium and glycaemic control. Zinc is useful in synthesis, storage and secretion of insulin. However, no correlation was found between zinc and glycaemic control in this study.

Conclusion: Serum chromium significantly correlated inversely with glycaemic control. Persons with DM should be encouraged to eat local specific food rich in chromium. A study of locally available food is essential so that patients can be better informed.

No conflict of interest

P-1126

Diabetes control achieved without increase in hypoglycemic medication in DM2 patients on medical nutrition therapy

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Aims: Due to the progressive nature of diabetes type 2, it's generally expected that patients will need to initiate pharmacotherapy or add more hypoglycemic agents to keep their diabetes under good control. Most published studies measure changes in A1c over time, without addressing the change in hypoglycemic medication which could happen concurrently. The objective of this retrospective study is to assess the impact of individualized Medical Nutrition Therapy (MNT) on the diabetes control of type 2 diabetics, controlling for the possible effect of diabetes medication.
Materials and methods: Of the 1136 DM2 adult patients referred by physicians to a clinical dietitian/diabetes educator for diabetes management education, 615 patients kept follow-up appointments, had A1c and medication information available, meeting the inclusion criteria for this study. 56% were females and 44% males, average age was 62 years and the mean number of years since diagnosis of DM was 6 years. 35% of the patients were not on any hypoglycemic medication and 65% were on DM medication at the time of initial education. The initial 1* hour appointment included an assessment, instruction on diabetes management, and development of a personalized meal plan with 30 to 60 grams of carbohydrate per meal and 15 to 30 grams per snacks. A reduction of 500 kcal/day was applied to the meal plans of overweight patients and increase in physical activity was encouraged. Education also included carbohydrate counting, label reading, food portioning and glucose monitoring. Thirty-minute follow-ups were scheduled at least 3 month intervals, glucose diaries were reviewed and recommendations reinforced. Statistic analysis was performed using a multiple regression model controlling for change in hypoglycemic medication use, A1c and weight at 3, 6 and 12 month follow-ups, compared to initial measurements.
Results: Individualized MNT generated statistically significant improvement in glycemic control (A1c), independently of medication effect. The mean A1c was 6.8, 6.5 and 6.5 mg/dl at 3, 6 and 12 months. BMI decrease was also statistically significant, with patients losing an average of 7.0 kg/year. Weight loss was associated with decrease in A1c and independent of medication effect. Change in DM medication at 12 months reflected more patients off or on less medication, and only a statistically insignificant number of patients on more medication.
Conclusion: This 12-month retrospective study demonstrates that individualized MNT can lead to diabetes control without the need for increase in DM medication. This positive effect is probably related to the weight loss, improved lifestyle and carbohydrate intake of educated patients. Further research should investigate the impact over a longer period of time.

No conflict of interest

P-1127

Effects of green tea consumption on metabolic and anthropometric indices in type 2 diabetic patients

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Aims: Diabetes is a worldwide high prevalence disease and the rate of diabetic patients is growing rapidly. Cardiovascular disease (CVD), the most important cause of mortality among these patients, is believed to be triggered, at least in part, by two key processes; glycation and oxidative stress. It is therefore likely that antioxidants may help to manage prevention of diabetic long term complications. Green tea, a popular Chinese beverage, is a good source of antioxidant polyphenolic compounds including Epigalocatechin gallate. This study was undertaken to evaluate the possible effects of different daily doses of green tea intake on certain metabolic and anthropometric biomarkers in type 2 diabetic patients.
Methods: A total of 63 patients of known cases of diabetes mellitus type 2 (28 male and 36 female) were introduced to a randomized clinical trial and randomly assigned to three groups for a two months interventional study. First group drank four cups of Green Tea per day (n=24, mean age=56.2), second group drank two cups of Green Tea per day (n=25, mean age=54.6) and third group was control group and didn't drink green tea (n=14, mean age=52.0). Patients in Green Tea groups prepared Green Tea with a 2.5g tea bag in a standard method. At the beginning and in the end of intervention, fasting venous blood samples (10 cc) were taken from all patients (test and control) and dietary assessment was done using 24hr recall diet questionnaire. Anthropometric (height & weight) and blood pressure measurements were also carried out in the beginning and at the end of the intervention.
Results: Daily intake of 2 or 4 cups of green tea per day did not have any significant effect on fasting blood glucose, total cholesterol, LDL cholesterol, triglyceride, blood urea nitrogen, creatinine, apolipoprotein A1 and B100, total antioxidant capacity and malondialdehyde. BMI (27.45 to 26.94, $p<0.0001$) and systolic blood pressure (126.25 to 118.64, $p<0.01$) in patients in the 4 cups of Green Tea group significantly decreased, and also the waist circumference of both Green Tea groups decreased (95.82 to 91.56 in 4 cups Green Tea and 93.63 to 90.65 in 2 cups Green Tea group, $p<0.001$).
Conclusion: Daily intake of green tea may help to prevent hypertension, and may help weight control in diabetic patients.

No conflict of interest

P-1128

Dietary intervention in patients with metabolic syndrome: short and long-term effects on abdominal obesity

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Background: Caloric restriction is a key element of a weight loss program in Metabolic Syndrome (MS) management. In some studies obese men and women had different short- and long-term outcomes in dietary intervention. Our aim was to assess prospectively the short- and long-term effects of a calorie-reduced diet on obesity anthropometric measures like body-mass index (BMI), waist circumference (WC), waist-to-hip ratio (WHR) and compliance to the diet in men and women with MS.
Methods: 60 MS patients were enrolled according to IDF criteria (36 men) with average age 48±13 years. BMI at baseline = 33.4 ± 4.9 kg/m2 both sexes; WC=115.3 ± 11.3 cm men, = 108.8 ± 9.6 cm women; WHR = 1.02 ± 0.06 men, = 1.00 ± 0.07 women. We compared obesity anthropometric changes in two diet programs: short-term hypo-caloric diet of 1800 kcal per day during 3 weeks supervised by hospital physicians; after that diet was home-based and completed by the participants on their own during 6 months
Results: At 3 weeks, in supervised group there were significant reductions in all obesity anthropometric measures in both sexes ($p < 0.0003$); however, men have achieved larger reduction in WC and WHR than women (baseline-3weeks difference WC men = 4.6 ± 1.7 cm vs difference WC women = 3.7 ± 2.1 cm; difference WHR men = 0.03 ± 0.01 vs difference WHR women= 0.027 ± 0.01). At 6 month unsupervised patients had less WC and WHR reductions compared with 3 weeks data (WC men 112.1 ± 10.7 cm vs 110.6 ± 10.4 cm; WC women 103.0 ± 6.9 cm vs 104.7 ± 9.3 cm; WHR men = 1.0 ± 0.05 vs 0.99 ± 0.05; WHR women = 0.96 ± 0.05 vs 0.98 ± 0.06). Compliance to the home-based diet was related to sex (women better than men) and was associated with greater reduction in WC and WHR in women. At 6 months home-based diet men had a significant increase in abdominal obesity compared with 3 weeks diet (difference 3weeks-6months WC = - 1.44 ± 2.9 cm men, p=0.02; difference WHR = - 0.014 ± 0.02, p=0.003)
Conclusion: In this prospective study supervised short-term hypo-caloric program is more effective than home-based 6 months diet. We demonstrated the predictive value of gender in outcomes: men had greater reductions in WC and WHR in short-term supervised program, but due to the less men compliance to the long-term home-based diet, women had greater reduction in WC and WHR after 6 months

No conflict of interest

P-1129

Effect of dietary carbohydrate to protein ratio on body weight, body composition and glycemic control in Type 2 diabetes

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Background & aim: We tested the hypothesis that by making up the deficient proteins in a meal, up to standard recommended levels, in the usual low protein Indian diabetic diet, we would achieve a better glycemic control. Protein extracts, which did not alter the taste or the usual cultural food practices, such as consumption of rice and chapatti, were provided as a Carbohydrate:Protein (CP) Balanced diet.

Methodology: 18 Type 2 diabetics, 8 cases (Consuming CP Diet) and 10 controls (Consuming usual diet), of either sex, aged 18-60 yrs, with an HbA1c 7.5 – 10 (both inclusive) were enrolled. Only those patients who were on stable treatment of diabetes with a stable weight (+/- 3 kg variation in previous 3 months) were included. Patients with diabetic nephropathy, secondary causes of obesity, neuropsychiatric disorders or on weight altering drugs were excluded. Written Informed Consent was taken, the protocol which was approved by the Independent Ethics Committee was explained to the subject. Electronically measured, balanced protein meal was provided to achieve an ideal (CP) ratio, through a structured diet chart containing calories as determined by their BMR. Oral meal tolerance test was performed at 30 min, 60 min, 90 min and 120 min after the ideal CP meal to assess glycemic control.

Results: Clinical characteristics were comparable among the cases and controls with respect to age (48.13 & 50.38), sex, anthropometry (BMI 34.1 & 32.87, W/H 0.91 & 0.94), renal profile (GFR 149 ml/min & 106 ml/min), duration of diabetes (7.25 & 5.25yrs) and diabetic treatment.

The Oral meal tolerance test results were as follows:

	CASE	CONTROL	%Age Rise Case	%Age Rise Control	P Value
FBS	168.8	138.7	-	-	-
30 MIN	207.2	197.2	20.1±17.7	41.2±23.1	0.07
60 MIN	207.5	228.2	21.7±18.2	64.7±16.8	0.0001
90 MIN	217.2	224.5	28.1±21.2	61.6±16.6	0.003
120 MIN	197.3	208.5	17.3±20.5	49±21.8	0.01

Discussion/conclusion: Patients who consume a CP balanced diet have a better postprandial glycemic control than those who consume a normal diet. In this study we observe that the diabetic subjects on CP Diet have lower peak of glucose and a lesser (around 29 mg/dl) postprandial rise in blood sugar when compared to the diabetic controls on normal diet. The controls had a total rise of around 70 mg/dl.

This suggests that a simple increase of the dietary proteins to the recommended value in usually low protein Indian diet would improve the glycemic control to a significant extent. Long term studies would be needed to confirm this hypothesis.

No conflict of interest

P-1130

Can a low glycaemic index-based dietary intervention produce a sustained improvement in glycaemic control?

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Background: Previous studies have reported that intensive diabetes management can significantly reduce the complications of diabetes. However, in many patients, the diabetes control deteriorated after the end of the intensive therapy. Recently, we have shown that low glycemic index (GI) -based dietary intervention resulted in significant improvement in serum fructosamine (at 4 week), fasting and postprandial plasma glucose among Asian patients with type 2 diabetes over a 12-week period compared to those following a conventional carbohydrate exchange (CCE) diet. Whether this improvement goes beyond the 12 week period is of interest in the current analysis.

Aims: In the 12-week post intervention follow-up visit, we examined the changes in the glycemic control after the discontinuation of the active phase of the dietary intervention.

Methods: Patients (n=104) with established type 2 diabetes were randomly assigned to low GI (n=52) or CCE (n=52) intervention groups. After 12 weeks of active intervention, patients who had still met the initial study criteria were followed at week 24. Per protocol analysis was performed to compare the changes in glycemic control, anthropometric measurement and dietary intake between the two groups.

Results: At week 24, the GI group had a larger reduction in HbA1c (Δ= -0.6±0.1%) than the CCE group (Δ= -0.3+0.1%). There was a trend for more subjects from the GI group (41%) achieving the HbA1c target of <6.5% compared to the CCE group (23%) (p=0.07). Similarly, subjects in the GI group were able to maintain a higher fibre intake and lower dietary GI than those following the conventional dietary advice.

Conclusion: The beneficial effect of low GI-based dietary intervention on glycemic control and nutritional intake persisted 12 weeks after the end of the active phase of the intervention.

No conflict of interest

P-1131

A short-term, self-financed meal replacement program improved metabolic control of overweight or obese Chinese patients with type 2 diabetes

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Aim: To evaluate the effects of a short-term self-financed meal replacement program in overweight or obese Chinese patients with type 2 diabetes.

Method: This is a retrospective analysis of a set of prospectively collected data (from February 2008 to January 2009). Patients with body mass index (BMI) >23kg/m^2 and type 2 diabetes in the absence of severe diabetic complications from the Diabetes Centre were invited to join the self-financed meal replacement program. They were started on meal replacement formulae (Resource® Diabetic / Glucerna SR™ / Nutren® Diabetes) to replace 2 usual meals for 12 weeks. Body weight (BW), fasting blood glucose (FBG), HbA1c, lipid levels and blood pressure (BP) were measured before and after the intervention.

Results: Forty patients (M: F=27:13) with mean age 49.1±8.3 years and duration of diabetes 9.3±5.8 years joined the program. Baseline BW was 86.5±16.9kg. BMI was 31.7±4.7kg/m^2 and HbA1c was 9.0±1.4%. All patients were on oral anti-diabetic drugs (OADs) and 18 (45%) were also on insulin. Only 23 (58%) completed the 12-week program (completers). The main reasons for withdrawal were intense hunger (53%) and monotony (17%). No participant withdrew because of financial difficulty. Detail analysis showed that improvements in metabolic control were only achieved in completers.

Table 1 Improvements of metabolic control in the completers:

	Baseline	Week 12	Change	P
BW (kg)	87.2±18.7	83.7±18.3	-3.5±2.4	<0.01
BMI (kg/m^2)	31.9±5.1	30.6±4.9	-1.3±0.85	<0.01
FBG (mmol/L) (n=21)	10.0±3.5	7.7±1.9	-2.3±3.5	<0.01
HbA1c (%)	8.9±1.5	7.1±0.8	-1.8±1.1	<0.01
Systolic BP (mmHg)	139.1±16.1	131.9±19.8	-7.2±13.1	0.026
TG (mmol/L) (n=15)	2.38±1.4	1.83±1.0	-0.55±0.75	<0.01

Nine completers required a reduction of OADs or insulin dosage whereas three had an increase at the end of the intervention. The proportion of completers achieving a HbA1c level of <7% (the American Diabetes Association's recommendation for glycemic control) increased from 13% to 52% (P<0.01). Hypoglycemia and constipation were reported in 48% and 39% of completers respectively.

Discussion/conclusion: The results showed that short-term meal replacement improved metabolic parameters of overweight or obese Chinese type 2 diabetic patients. Over-consumption of the third meal and mild hypoglycemia with compensatory food intake might explain the small amount of weight loss (-4%) achieved. This study also demonstrated the feasibility of self-financing of meal replacement formulae in clinical practice. The small sample size, short duration and the non-randomized, non-controlled retrospective design, however, limited the strength of the results. We concluded that self-financed meal replacement may potentially be an effective strategy to improve the metabolic control in overweight or obese Chinese patients with type 2 diabetes.

No conflict of interest

P-1132

Nutritional intervention and body weight change in outpatients with type 2 diabetes mellitus, Sao Paulo, Brazil

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The prevalence of Diabetes Mellitus is around 7,6% in Brazil and it is one of the most important risk factor for cardiovascular disease, which is the first leading cause of death.
Aim: to evaluate nutritional intervention among patients with metabolic syndrome and type 2 diabetes (DM2) according to weight change.
Methods: it is a follow-up study of nutritional intervention including all the patients from the Metabolic Syndrome and Nutrition Health Care from Federal University of Sao Paulo, Brazil who undertook 3 nutrition counsellings followed by 8 months during 2008. Metabolic syndrome was defined on the basis of the National Cholesterol Education Program Adult Treatment Panel III criteria (2006). Weight was measured at 3 different times (pre intervention, mean of 2 months and after a mean period of 4 months). All the patients received an individualized meal plan (hypocaloric and adequate in macro and micronutrients). A 24hour food recall was applied at each counselling when doubts on the diet plan were solved, tips about eating out were given and patients were encouraged to follow the diet and to self monitor eating behaviour.
Results: there were 42 patients (14 men; 28 women); mean age was 56 (± 9) years; there was a significant decrease in the mean weight (86,9 ± 19,7 vs 85,8 ± 19,9 kg) and in the body mass index (33,2 ± 6,2 vs 32,8 ± 6,3 kg/m^2) after the nutritional intervention among all the participants, specifically among women (84,6 ± 18,7 vs 83,1 ± 18,9 kg; 34,0 ± 6,4 vs 33,4 ± 6,5 kg/m^2) but not among men. Almost 11% of the women achieved normal weight by height. It was not shown any association between weight reduction and gender, neither age, school aging and marital status.
Conclusion: Nutritional counselling and a personal meal plan showed good results among women, who had a significant decrease in the mean weight and in the body mass index as compared to men although, there was no association between weight reduction and gender. The follow-up period can be considered a limitation for more significant results.

No conflict of interest

P-1133

Management of a case of neonatal diabetes secondary to pancreatic agenesis

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Case report: A symmetrical IUGR male infant born G1P1 mother at 37weeks was found to have hyperglycemia (19 mmol/L) in the first day of life, and insulin therapy was commenced. Further examination revealed a non-dysmorphic child with an atrial-septal defect, pulmonary valvular stenosis (PVS) and a left congenital diaphragmatic hernia (CDH). Surgical repair of the PVS and CDH allowed abdominal exploration, which failed to reveal a pancreas or gallbladder. Nutritional management of this patient was complicated by failure to thrive secondary to pancreatic exocrine insufficiency. Despite initiation of pancreatic enzymes, the baby continued to have problems with weight gain (wt and wt-for length <3 percentile on CDC growth curves) and eventually required admission at age 8 months for continuous IV insulin infusion and nutritional repletion. The infant was fed orally using a hypercaloric infant formula (partially-hydrolyzed protein) with added glucose polymers (polycose) and medium chain triglycerides concentrated to 1 kcal/ml. Nutritional intakes were maintained via naso-gastric tube supplementation, and solids were introduced to preserve and enhance normal developmental oral-motor skills. Blood glucose was extremely variable with significant episodes of hyper and hypoglycemia. Two weeks post admission, the baby was switched to a regime consisting primarily of insulin glargine (0.6 u/kg/d) q am with sliding scale lispro (1:10 dilution) 5 times/day and subsequently insulin carbohydrate ratios to avoid hypo and hyperglycemia when food refusal behaviors began. Insulin pump therapy was not possible at this time due to a lack of subcutaneous tissue. Although this regime helped greatly with weight gain, nocturnal hypoglycemia secondary to pancreatic endocrine insufficiency remained a problem despite the addition of raw cornstarch to nocturnal feeds. At age 18 months nocturnal hypoglycemia were diminished greatly when a subcutaneous insulin pump was initiated. The patient, at two years of age, is now thriving (wt and wt/length 10-25 percentile) with good metabolic control and normal feeding behaviors.
Conclusion: We describe the difficulties in management of a child with neonatal diabetes secondary to pancreatic agenesis. Insulin pump therapy allowed the flexibility needed to address both exocrine and endocrine pancreatic deficiencies and should be considered early on in management of these rare cases.

Conflict of interest:
Paid lecturing: Evelyne Pytka-Animas Corporation (Division of Johnson and Johnson)
Other substantive relationships: Certified insulin pump trainer - Animas Corporation (Division of Johnson and Johnson). Certified insulin pump trainer Accuchek Spirit (Roche/Distronic). Certified insulin pump trainer Cozmo (Smiths Medical Inc)

P-1134

Impact of sweet preference and sweet taste sensitivity on specific eating pattern or life-style related disease

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Aims: Although sweet preference or sweet taste sensitivity is considered to influence specific eating pattern or life-style related disease, few reports have shown an association between them. Recently we reported that genetic polymorphisms affect obesity along with individual sweet preference in humans. Thus we examined the associations of sweet preference and sweet taste sensitivity with specific eating pattern or life-style related disease to obtain further insight into their relationships.
Methods: We recruited 48 Japanese patients with life-style related disease (21 males and 27 females). Blood samples were drawn after overnight fasting. A questionnaire of sweet tooth was asked to each subject, as followed: "Do you like a sweet taste?" and the answer was chosen from one of the following choices; 1. No, I hate it; 2. No, I don't like it very much; 3. Neither yes or no; 4. Yes, I like it; and 5. Yes, I like it very much. The written answers were confirmed during an interview. We defined the subjects who selected number 5 as having a sweet preference and those that selected answer number 1, 2, or 3 as the controls. We also examined individual sweet taste sensitivity using the paper disk methods. Further nutritionist examined specific eating pattern in a unified way. All examinations were done on the same day, and we evaluated the association among these parameters using variance analysis or logistic regression analysis with consideration of potential confounding factors (age, sex).
Results: When clinical characteristics were compared between the subjects with sweet preference and the controls, the results indicated that LDL and total cholesterol values were significantly higher in the subjects with sweet preference (p values: LDL, 0.022; total cholesterol, 0.036). There were no significant associations between sweet taste sensitivity and clinical parameters. In addition, the subjects with sweet preference significantly ate more fatty meal than the controls (p=0.047), especially they tended to eat diet in higher saturated fatty acid (p = 0.083).
Discussion and conclusion: This was because something sweet tends to contain saturated fatty acid in abundance like cake or ice cream, we considered that the subjects with sweet preference significantly ate more fatty meal than the controls. In conclusion, we considered that our findings may contribute to better management of obesity or lifestyle-related diseases.

No conflict of interest

P-1135

Camel milk, adjunct to insulin therapy, improves glycemic control and lowers insulin requirement without risk of hypoglycemia in patients with type 1 diabetes: 2 years randomized controlled trial

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Aim: To assess the efficacy, safety and acceptability of camel milk as an adjunct to insulin therapy in type-1 diabetics.
Methods: In this two year randomized clinical parallel design study, 24 type-1 diabetics were enrolled and divided in two groups. Group-I (n=12) received usual care i.e. diet, exercise and insulin and group-II (n=12) received 500ml camel milk in addition to usual care. Insulin requirement was titrated weekly by blood glucose estimation. Results were analysed using ANOVA.
Results: In camel milk group, there was significant decrease in mean blood glucose (118.58±19 to 93.16±17.06 mg/dl, $p<0.001$), HbA_1c levels (7.81±1.39 to 5.44±0.81%, $p<0.05$) and insulin doses (32.50±9.99 to 17.50±12.09u/day, $p<0.05$). Out of 12 subjects receiving camel milk, insulin requirement in 3 subjects was reduced to zero. There was no significant change in C-peptide, plasma insulin and anti insulin antibodies in both the groups.
Conclusions: Camel milk is safe and efficacious in improving long-term glycemic control with a significant reduction in the doses of insulin in type-1 diabetic patients.

No conflict of interest

P-1136

Assessment of glycaemic index of dietary and herbal based mucilages on the selected type 2 diabetic subjects

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Aim: To assess the Glycemic Index and Glycemic load of the prepared okra mucilage powder.
Methods: Diabetes mellitus is a physiological problem affecting the lives of millions of people and one of the leading causes of death. It has the world's largest diabetic population in terms of numbers with over 3.5 million people affected with Diabetes mellitus. Okra (Ladies Finger) is valued for its edible, delicious and nutritious green fruits as vegetables throughout the world. The fruit contains mucilaginous material that has several medicinal uses. Hibiscus Rosa-sinensis is commonly found throughout the tropics and a house plant throughout the world. Flowers are used to treat diabetes. For the present study, matured okra fruits and hibiscus flowers are selected and the mucilage was extracted using physical and solvent method and it was finally made into powder. About 125 Type 2 diabetic subjects belonged to the age group of 30-55 years were surveyed. Among them 50 were selected for the Glycemic Index assessment and they are divided into five groups with 10 diabetic subjects in each group. Group I was kept as control group, Group II and Group III was supplemented with 3 grams of okra and hibiscus mucilage powder incorporated in Rice based idlis respectively and Group IV and Group V was supplemented with 3 grams of okra and hibiscus mucilage powder incorporated in Finger millet based idlis respectively. The study was approved by the Institution ethical committee. The developed food products are organoleptically evaluated and analyzed for the available carbohydrates. The data were analyzed using ANOVA and Duncan's multiple range tests to find the significance difference.
Results: It revealed that all the developed recipes are highly acceptable with the available carbohydrate of 49.19g, 53.59g for rice based okra and hibiscus mucilage powder incorporated idlis and 51.57g, 54.7g for finger millet okra and hibiscus mucilage powder incorporated based idlis. The mean glycemic index and glycemic load was found to be 81.01 and 44.70 respectively for Group I, 76.17 and 37.4 for Group II, 83.69 and 43.32 for Group III, 67.68 and 43.48 for the Group IV, 79.80 and 53.25 for Group V subjects. Duncan's test revealed that there was a significant difference ($P< 0.05$) in the Glycemic Index and Glycemic load between okra and hibiscus mucilage powder incorporated idlis with the control group.
Conclusion: Thus the study concludes that the addition of okra and hibiscus mucilage has produced beneficial effects on controlling the diabetes by reducing the Glycemic Index among the selected diabetic subjects.

No conflict of interest

P-1137

Effects of Ramadan fasting on some risk factors of type 2 diabetes in Indian origin adult Muslims living in the North-West province of South Africa

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Aims: The present study investigated the effects of Ramadan fasting on some risk factors of type 2 diabetes in Indian origin adult Muslims living in the North-West province of South Africa.
Methods: Initially, a total of 52 subjects (31 male, mean age 49.87 years and 21 female, mean age 41.20 years) participated in the study, however the final data were possible to collect only from 44 subjects (26 male and 18 female). The initial and final data for height, body weight, waist circumference, hip circumference, body fat percent, and systolic and diastolic blood pressure were taken on the 0th and 28th day of Ramadan month, respectively. The body mass index (BMI) and waist-hip ratio were calculated from the collected data.
Results: It was found that the body weight, waist circumference and BMI were significantly ($p < 0.05$) decreased at the end of the Ramadan month. The systolic and diastolic blood pressures were also significantly ($p < 0.05$) decreased in subjects with high blood pressure while increased up to an optimal level (systolic: 75-80 mmHg and diastolic: 115-120 mmHg) in subjects with a history of low blood pressure. The waist-hip ratio was markedly ($p = 0.087$) decreased at the end of the Ramadan fasting. However, the hip circumference and body fat concentration were not influenced by the Ramadan fasting.
Conclusion: The data of this study suggest that Ramadan fasting has some beneficial effects on the reduction of several risk factors of type 2 diabetes and metabolic syndrome.

No conflict of interest

P-1138

Voglibose inclusion liberalizes diet (VILD): a simplified approach to diet therapy treated early type 2 diabetes patients

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Background and aims: Conventional diet (CD), based on Exchange Table, is frequently adopted by the physicians in developing countries with scarcity of Nutritionists. In "VILD" approach, "Voglibose" is added before major meals to delay carbohydrate absorption. Although common sugar is allowed sparingly, sugar dense items are denied totally and Fat dense edibles allowed in limited quantity, during festivals only.
Present study aimed to evaluate results of VILD versus CD.
Research and Design: 30 drug naïve early cases (duration of T2D =1 year), A1c 7 to 8% on CD were randomized into 2 groups - one continuing with CD and the other offered VILD approach. Follow up period was 12 months with bimonthly OPD visits. Both groups had matchable baseline characteristics:-

Characteristics	CD	VILD
Age (yrs)	51.26±6.32	52.40±6.96
DOD (months)	7.13±2.85	6.60±2.74
Wt (Kg)	68.21±7.25	68.32±7.18
BMI (Kg/M^2)	26.53±2.88	25.83±1.89
FBG (mg%)	112±7.52	120±9.18
PPBG (mg%)	167.06±7.01	179.53±11.51
ABG (mg%)	140.93±7.01	149.76±7.74
A1c (%)	7.71±0.09	7.56±0.22

Results: VILD group revealed better outcomes, as shown in the table:-

Characteristic		CD	VILD
FBG (mg%)		-4.65±7.45	-12.10±8.29
PPBG (mg%)		-9.00±10.76	-32.98±13.12
ABG (mg%)		-8.10±5.19	-22.56±9.66
A1c (%)		-0.003±0.97	-0.43±0.28
Wt (Kg)		0.91±0.74	0.08±0.53
BMI (Kg/M^2)		0.32±0.24	0.02±0.21
Lipid Profile	Total	-16.06±22.52	-18.26±27.87
	TG	-18±33.99	-16.60±19.87
	LDL	-13.26±22.38	-19.20±27.02
	HDL	1.13±2.47	4.26±1.94

While no pt in CD attained target A1c (<7%), 33.33% pts in VILD group did achieve. GI upsets were marginally more in VILD group (9%) compared to CD (5%)

Conclusion: VILD Approach can be a good solution to the problem of non availability of Nutritionists in developing countries, since it alleviates the need for special diet cards; in addition, it yields better clinical outcomes too.

No conflict of interest

P-1139

A comparative study of dietary habits and anthropometric changes in diabetic and non-diabetic groups in the same socio-cultural backgrounds

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Aims of the study:

1. To compare the dietary pattern and habits among diabetic and non diabetic people in the same ethnic and socio cultural backgrounds.
2. To compare the anthropometric measurements in diabetic and non diabetic people in the same socio cultural backgrounds.

Materials and methods: This was a case control study.153 subjects having diabetes of varying duration on treatment were compared with 153 non diabetics matched for age, gender, cultural and religious backgrounds. Those having familial hyperlipidemias, hypothyroidism and those on glitazones, lipid lowering drugs were not included. Detailed history, social habits, and anthropometry done in both the groups and were compared.

Observations: The age group ranged between 26 and 85 years with mean age of 53.93 ±10.66. There were 86 (56.2%) males and 67 (43.8%) females among both the groups. The groups were comparable in religious background, smoking and alcoholism. Among the diabetic subjects mean caloric intake was 1285.96±222.35 and among the controls it was 1166.66±266.3 (p = 0.00). Mean carbohydrate consumed among subjects was 259.00±54.84 and controls was 250.92±57.32 (p = 0.21). Mean Protein consumption among diabetics was 46.41±17.15 and among controls was 42.10±11.61 (p = 0.01). Mean Fat consumption among diabetics was 23.36 ± 6.35 and among controls was 20.412± 6.94 (p = 0.00). Among the diabetics mean BMI was 25.18±3.89 and 24.12 ±3.20 among the controls (p = 0.009). Among Diabetics, mean BMI of males was 24.46±3.24 and of females was 26.11±4.45 (p = 0.009).In females mean BMI was 24.34±3.62 for controls and 26.11±4.45 for diabetics (p=0.013).Among the diabetics mean waist circumference was 92.07±8.997. Among the controls it was 87.73 ± 8.76 (p = 0.00). Among diabetics mean waist circumference of males was 89.71±7.88 and of females was 95.1±9.48 (p = 0.000) and among controls mean waist circumference of males was 87.41±7.87 and of females was 88.14±9.84 (p = 0.61). Among females mean waist circumference was 88.15±9.84 for controls and 95.11±9.48 for diabetics (p=0.000).

Conclusions: Mean calorie, carbohydrate, protein and fat intakes were higher in the diabetic group compared to the controls. Mean BMI was higher in the diabetic group. Mean BMI and waist circumference was higher in females in the diabetic group compared to males. Moreover females in the diabetic group had higher BMI and waist circumference compared to the females in the non diabetic group.

No conflict of interest

P-1140

Effect of oyster mushroom (Pleurotus spp.) on glycemic control, lipid profile and diabetic quality of life in type 2 diabetic patients - double blind placebo controlled study

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Aims and objectives: The aim of the study was to evaluate the efficacy of oyster mushroom (pleurotus spp.) on glycemic control, lipid profile and diabetic quality of life in type-2 diabetic patients.

Material and method: Study design: A randomized double blind placebo controlled study.

Total 150 type-2 newly onset diabetic patients were recruited. After 1 month stabilization period 120 patients were randomly selected. These patients were divided into three groups Group-1 given type A biscuit, group 2 given type B and group 3 given type C biscuits by dietician without any awareness about nature of the biscuits. All the three groups were also given conventional treatment i.e. diet, exercise for 3 months. Anthropometric parameters, FBS and BP were recorded weekly and HbA_1c, lipid profile, diabetic quality of life questionnaire were performed initially as well as after 3 months. After 3 months decoding was done and concluded that type A biscuits were Ajwain biscuits, type B were Ajwain + Mushroom biscuits and type C were Mushroom biscuits.

Results: After 3 months period blood sugar was found reduced in ajwain+mushroom group (225.41±3.35 to 113.83±4.03; p<0.005) as also in mushroom group (212.9±4.29 to 112±1.37; p<0.005), Systolic blood pressure reduced in both groups ajwain + mushroom (130.75±2.10 to 121.50±1.16; p<0.05) and in mushroom group (126.8±1.73 to 121.65±1.3; p<0.05), Diastolic blood pressure reduced in [ajwain + mushroom group (85.00±1.31 to 79.70±0.70; p<0.05) and in mushroom group (82.00±0.96 to 79.95±0.79; p<0.05)]. There was also significant effect on glycemic control (HbA_1c) in both groups [ajwain + mushroom group (8.47±0.17 to 7.27±0.14; p<0.02) mushroom group (8.00±0.13 to 6.99±0.12; p<0.05)], there was significant reduction in lipid profile i.e. total cholesterol ajwain + mushroom group (190.69±4.39 to 166.83±2.47; p<0.001) and mushroom group (186.77±3.43 to 157.39±2.32; p<0.05), HDL in ajwain + mushroom group (40.42±0.92 to 45.40±0.91; p<0.005) and in mushroom group (45.81±2.03 to 49.30±1.47; p<0.05), LDL in ajwain + mushroom group (110.05±2.55 to 98.21±1.38; p<0.05) and mushroom group (103.04±3.41 to 96.99±3.30; p<0.05), VLDL in ajwain + mushroom group (42.62±2.03 to 28.62±1.26; p<0.05) and in mushroom group (42.42±2.35 to 31.40±1.81; p<0.05), serum triglyceride in ajwain + mushroom group (213.93±14.24 to 144.73±7.01; p<0.05) and in mushroom group (210.71±12.49 to 157.41±7.79; p<0.02), Diabetes quality of life also improved significantly but there was no significant change in BMI & waist hip ratio.

Conclusion: Oyster mushroom (pleurotus spp.) consumption appears to be effective in controlling glycemic control, lipid profile and diabetic quality of life.

Statistical method: Using ANOVA, confidential limit and correlation.

No conflict of interest

P-1141

Effect of varying the source or amount of dietary carbohydrate on glycemic and insulinemic response in subjects with type 2 diabetes

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Background and aim: Diets of low glycemic load (GL) may dampen postprandial glycemic response which is beneficial for managing insulin resistance. The GL can be reduced by decreasing either carbohydrate intake or glycemic Index (GI). The present study was carried out to investigate whether these 2 dietary maneuvers have the same effects on glycemic and insulinemic response in subjects with type 2 diabetes.

Methods: This study was conducted in 15 newly-diagnosed type 2 diabetic patients (age: 52.8±9.26 y; BMI: 25.17±2.69 kg/m^2; disease duration: 2.7±1.8 y; fasting blood glucose level: 128.00 ± 25.58 mg/dl). Subjects received the experimental dinners on 3 days with one week intervals. The three dinners were: 1- A medium-GL, medium-GI diet (62% CHO, 23% PRO., 15% fat;

GL=50), 2- A low-GL, low-GI diet (62% CHO, 23% PRO., 15% fat; GL=38), 3- A low-GL, low-CHO diet (52% CHO, 25% PRO., 23% fat; GL=38). Venous blood samples were collected before (after 12 hours fasting), 60 and 120 minutes after consumption of the standard breakfast (63% CHO, 17% PRO., 20% fat; GL=20). Serum glucose concentrations were determined by "glucose oxidase" method. Serum insulin assays were performed by "IRMA test". The data were analyzed with the use of a repeated-measure analysis of variance.
Results: Only varying carbohydrate amount (and not the GI) had an effect on 60-minute postprandial glucose response and also incremental area under the curve (AUC) for glucose (p=0.04). Varying neither the GI nor the carbohydrate amount had a significant effect on insulin response.
Conclusion: Reducing the amount of carbohydrate intake had a significant effect on glycemic response and GI couldn't predict postprandial glucose level in diabetic patients as accurately as GL, which is the combination of both the quality and quantity of carbohydrate. The two dietary maneuvers did not have any significant effect on blood insulin levels.

No conflict of interest

P-1142

Effectiveness of professional dietary guidance on dietary practices of diabetic subjects in Karachi, Pakistan

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Aims: Impact of dietary guidance given to diabetic subjects has not been assessed much in low resource communities. This study was planned to assess the effectiveness of professional and individualized dietary guidance on dietary practices of diabetic subjects.
Methods: Dietary guidance is given by dietician and clinical and dietary profile of Subjects is routinely recorded at patients first visit at BIDE. For this study 200 consecutive subjects were recruited to assess impact of dietary guidance and were invited to make a repeat visit after three months. On the basis of data recorded at first and repeat visit number of modifications needed in a patient's diet at each stage were calculated. Relative frequency of number of modification needed by the subjects was used to identify the individual having relatively better dietary practices. Reduction in total number modifications needed indicated improvement in diet.
Results: Out of 200 subjects, 50.7% were females. Mean age of subjects was 50.3 ±10.7 years. Significant improvement was seen at second visit in terms of intake of most of the food items (p value <0.005).
Conclusions: This first of its kind study from Pakistan, has documented the efficacy of dietary guidance and highlighted the need for utilizing professional services to persuade life style modifications in diabetic subjects.

No conflict of interest

P-1143

Analysis of food standard in educational activities for people with diabetes

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The prevalence of Diabetes Mellitus is increasing exponentially, bringing epidemic characteristics, especially in developing countries. The modification of feeding behavior appropriate and weight loss, associated with the practice of regular physical activity, are considered therapies coadjuvants to assist in the glycemic control these patients.
To assess the impact of food in the life of diabetic, we conducted a search with a population, during physical activity-recreational and educational performed on the World day of Diabetes. Investigation was carried out food frequency, measured fasting and post-prandial capillary glycemia. Data were analyzed by SPSS 14.0 program and through the chi-square with a significance level of 5%
It was possible to observe this examines what in the total of 126 individual interviewees, 28.6% had diabetes mellitus. The greater prevalence in daily diet was fruit with 64.3 %, followed by coffee less than 63.5 %, and juices 54.8 %. In relation to consumption of sweets found: 67.1% wore saps with sugar 3 times/week; 48.2% interfered soft drinks 1 time/week and 23.2% 3 times/week; 65.2% consumed desserts once/week and; 66.7% interfered chocolate once/week and 52.4% bullets. The intake of fruits and vegetables was: 34.1% consumed 3 times/week and 46.3% once/day. Fried food was consumed in 49.3% once/week and 40.3% once/day. There was no significant relationship with the presence of diabetes and: ingestion of saps (X2=3.259, p=0.196), soft drinks (X2=2.149, p=0.542), chocolate (X2=1.434, p=0.231), fried food (X2=6.371, p=0.383) and bullets (X2=2.436, p=0.656). There was no relationship between the consumption of foods and glycemic level.
We conclude that the dietary patterns of individuals analyzed were inadequate, with low consumption of fruit and vegetables and frequent ingestion of sweets. There was no difference between the pattern of food in non-diabetic and diabetic. We need greater awareness this population in relation to food.

No conflict of interest

P-1144

Nutrition education with emphasis on carbohydrates and glycemic index

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Aims: To assess the understanding of diabetes on benefits of a healthy diet, counting carbohydrates and application of the glycemic index (GI).
Methods: 19 type 2 diabetic participants of an education program in diabetes (age 30-75 years), attended a nutrition education project focusing on CHO and GI, consisting of 7 lectures on healthy eating for diabetics, one of a specific count of CHO and other of GI and cooking workshop. They received a table of GI and CHO counting specially prepared. In the final, subjects answered a questionnaire. All subjects gave written informed consent. This investigation was approved by the institutional review boards of the University of Brasília, Brazil.
Results: 31.57% (n = 6) hit the question "What is GI?" 89.47% (n = 17) said that low GI (LGI) is related to full and rich in fiber, 68, 42% (n = 13) marked the high GI (HGI) are rich in CHO, usually processed and industrialized, only 21% (n = 4) related to GI cooking and the presence of fiber; and 100% (n = 19) mentioned fruits, vegetables, legumes and whole foods as LGI. Asked about the benefits of LGI diet, 100% marked: "Help to control weight" and "improves the glycemic control." 84.21% (n = 16), 73.68% (n = 14) and 10.53% (n = 2) answered "Control cholesterol," "Slow the absorption of CHO" and "Increases satiety" respectively. The answer: "It is bad to health", "are not indicated to diabetics", "fattening", "Leads to Diabetes" and "greatly increase the blood glucose" were not marked. In a list of 38 foods were asked to mark the LGI and HGI. 7 of these foods had index of accuracy of 100%, 8, 81-99% of hits, 8 of 61-80%, 10, of 41-60%, at 2, 21-40% and in 3 food <20% of hits. The concept of GI diet was confused with the increase of blood glucose. Others, associated HGI foods with high quantities of protein and fat and foods as not healthy.
Discussion/conclusion: In general, they showed the general knowledge of LGI and HGI food, its implications on health, examples and food of choice. The study may show the difficulties of a work of health education with adults and elderly, and require a wide work for results to be more expressive

No conflict of interest

P-1145

Low and high glycemic index diets: application with type 2 diabetes and its variations on glycemia

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Aims: To assess the impact of HGI and LGI diets on blood glucose and correlate with the amount of CHO consumed.

Methods: Transversal study applied cross-over. 12 type 2 diabetic participants of education program in diabetes were divided into 2 groups random and instructed to follow HGI and LGI diets for 2 consecutive days in 2 consecutive weeks. Group A in the 1st week followed a HGI diet and LGI diet on the 2nd week, group B took the opposite. All were oriented about the research and the need to maintain a regular use of medication and lifestyle, and follow the recommendations of the professionals on days of data collection. Measurements were made of capillary glycemia through own glucometers (Accu-check and OneTouchUltra) in 2 days (fasting, pre-lunch, post-prandial lunch and pre-dinner) and a fast glycemia in the 3 days. The food record was also made during the days in which it was possible to count CHO meals. To compare the variables were applied the Wilcoxon test and to correlate the data of glycemia with the amount of carbohydrate ingested before, the Pearson Correlation Coefficient test. Was used a significance level of 0.05. All subjects gave written informed consent. This investigation was approved by the institutional review boards of the University of Brasília, Brazil.

Results: The variation of mean glucose of the diabetics in the 1st week showed major in the HGI diet. Already in the 2nd week, the glycemia average fasting begins at the same glycemic value in both groups (132 mg/dl) and the LGI diet shows higher glycemia, but without statistical significance (p = 0,344). By the graph of dispersion made between the amount of CHO ingested and the glycemic responses, we could not see a correlation between variables (p = -0128).

Discussion/conclusion: There were distortions in the interpretation of food choices by patients, complications such as insomnia and stress which may have influenced the results. LGI diet shows is beneficial in the treatment of diabetes and glycemic control. It was possible to observe in practice the difficulties encountered by patients in their day to-day work with these diets, besides seeing that psychosocial factors influence its decisions on the very food choices. But the group has adopted food choices most appropriate when the glucose values were changed.

No conflict of interest

P-1146

Challenges of nutritional management of diabetes in Tanzania

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Background: Diabetes mellitus is an emerging serious medical problem globally. Among the contributing factors are unhealthy lifestyles such as poor nutrition and sedentary lifestyle. In Tanzania, the incidence of diabetes is rising much faster with little advancement in service delivery. As a result, diabetics are at increased risk of complications that occur early, resulting in substantial morbidity, mortality, and economic costs.

For better management of diabetes, a comprehensive care is required which include nutrition education. This is the corner stone for diabetes management if properly delivered, however in Tanzania that is not the case. Diabetes clinics are run without nutritionists or dieticians and in most cases, nutrition education is given by doctors or nurses who have not been given any formal training. As a result, myths and misconception regarding nutrition management of diabetes predominate due to inadequate, inappropriate, inaccurate, misleading and confusing nutrition information. Furthermore, there are no guidelines for nutritional management of diabetes, and limited locally developed and culturally sensitive nutrition education materials.

Current status of diabetes care and nutritional management of diabetes.

Tanzania has made a tremendous progress in improving diabetes care by establishing clinics at referral and regional hospitals with an extensive service to district hospitals and Primary Health Care. The clinics are equipped with resources, however human resource includes only doctors, nurses and lab technicians. Diabetes education particularly dietary and lifestyle education is lagging behind. Hospitals do not employ dietetic experts, and the structures of health facilities and that of the diabetes clinics do not include a nutritionist/ dietetic cadres

Proposed intervention: Nutrition education is the crucial component in diabetes care that plays an important role which consequently contributes to delay or even prevention of diabetes complication hence, a model of care which will advocate for a dietetic/nutrition cadre as part of comprehensive diabetes care is proposed as a long term solution. The use of trained nurses for provision of dietary education is proposed as a short term solution. The model should take consideration of shortage and workload of available staff, low literacy level of care providers and of patients, locally developed, cultural sensitive and user friendly materials

The model should contain a guidance tool to include nutrition management guidance booklet and its training manual; patient education materials to include information on dietary management of diabetes and lifestyle modification; Community reader materials to address risk factors, signs and symptoms and lifestyle modification for prevention of diabetes.

No conflict of interest

P-1147

Association between the food cooking techniques with decontrol metabolic in patients with type 2 diabetes from Hospital in Ixmiquilpan, Hidalgo, Mexico

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Some researches have shown that the morbidity due to type 2 diabetes, in Mexico the number of hospitalizations for diabetic complications metabolic (acute and chronic) have increased. In the last years the number of cases of type 2 diabetes has increased five times more than other pathologies; brought consequently it worsens conditions. The high levels of final advanced glycoxidation end products, in pleople with type 2 diabetes cause other conditions, as the neuropathy, retinopathy, nephropathy. The diet for people with type 2 diabetes based only on the restrictions of simple and complex carbohydrates, with the main aim is controled high levels of glucose; they do not bear in mind the risks associated with the high temperatures used in the different food cooking techniques as: roasting, frying and baking. These techniques induce the production of glicotoxines.

Aims: Determining the association of the food cooking techniques and the metabolic control in patients with type 2 diabetes from Instituto de Seguridad y Servicios Sociales de los Trabajadores del Estado, Hospital in Ixmiquilpan, Hidalgo.

Methods: It is a descriptive, analytical and transversal study which included 65 type 2 diabetes patients. We evaluated the survey includes those patients willing to answer questions about food cooking techniques, medical history, 24 hours reminders, patients who had complete exams as: triglycerides, serum glucose, preprandial and postprandial capillary glucose as well as those patients who had glycated hemoglobin.

Results: In 27 food with the high glycotoxines contained, that were included in the review of food cooking techniques, 10 of them was associated with poor control of glycemia and lipids on type 2 diabetes patients of the Hospital Instituto de Seguridad y Servicios Sociales de los Trabajadores del Estado in Ixmiquilpan.

Discussion/conclusion: The outcome of this study proves that the patients that utilize food cooking techniques, like frying, baking and grilling suffer decontrol glucose and lipids.

No conflict of interest

P-1148

Effect of nutritional plan high in proteins and low in carbohydrates in patients with type 2 diabetes of Actopan and Tizayuca clinics, in the Programa Estatal de Diabetes Hidalgo, Mexico

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The diabetes is a group of metabolic diseases characterized by hyperglycemia cost by defects in the insulin secretion, in the insulin's action or both, the majority nutritional treatment recommended 15-20% protein, 50-60% carbohydrates in patients with normal renal function.

Aims: Effect of a feeding plan with high content of proteins and low carbohydrates on glycemic control in patients with type 2 diabetes for the Programa Estatal de Diabetes Hidalgo in it clinics: Actopan and Tizayuca.

Methods: in this study were included 34 patient with type 2 diabetes which 17 were assigned of feeding plan with American Diabetes Association recomendations (15:55:30) and 17 a feeding plan modified in proteins (30:20:50) by a period of 12 weeks. It was included person both sex and between 18-60 years old. We applied a survey which include clinical interview, 24 hours follow-up, physical examination [weight, height, Body Mass Index (BMI), blood pressure], and blood tests [cholesterol HDL, LDL, triglycerides, glycated haemoglobin (A1c) and fasting glucose].

Results: The blood glucose diminished significant ($p<0.001$) from 125.9±32.1mg/dL to 114.1±24.4 mg/dL and 146.4 ± 63.6mg/dL to 121.7 ± 30.9 mg/dL in the 2 feedings plan respective; the A1c diminished significant from 8.5 ± 2.2% to 7.0 ± 1.0% ($p<0.05$). Additional there was a diminution in LDL, triglycerides ($p<0.05$) in weight and waist circumference ($p<0.001$) and BMI ($p<0.05$) in the feeding plan modified in proteins.

Discussion/conclusion: In this study was verified in proteins contribute and is an option recommendable a short time to the glycemic control.

No conflict of interest

P-1149

Evaluation of knowledge of the diabetics about nutritional label about light and diet references

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Introduction: The nutritional label is a means through which consumers get to learn about the products they buy. Most of the target consumers of many companies are the diabetics. Diabetes Mellitus is a disease characterized basically by an absolute or relative deficiency of insulin. In spite of the technological advance of food industry and the popularity of Light and Diet products, there is a certain difficulty for interpreting the nutritional values from the nutritional facts label. As the healthy feeding is a fundamental factor for a good control of DM, the knowledge about the nutritional label is quite necessary.

Objective: Evaluating the knowledge of diabetics about the nutritional label of diet and light products.

Methodology: A transversal study made with people with diabetes from Doce Desafio Program (Program of Health Education and Supervised Physical Activities for Diabetics/ University of Brasília).

Results: The data is composed by information from 40 individuals, from 20 to 78 years of age (Average = 59; DP = 13), with an average period of 9 years of diagnosis (DP = 8); 82,8% have coursed the High School; 57,5% (n=23) knew what a light product is, however 32,45% (n=13) thought that a light product is the one with a low level of fat or any fat if compared to the conventional product. Concerning the dietetic products, 15,3% (n=6) answered it is a product insent of a nutrient on its composition, and 64,4% (n=6) thought it was a special product for diabetics, believing it contains no sugar. 69,9% says the Diet and Light food nutritional label is hard to understand and when asked if there was any reduction of weight caused by the consumption of Diet and Light products, 52,25% (n=21) answered "sometimes"; 25,3% (n=10) answered "no" and 22,45% (n=9) answered "yes". In spite of the high schooling level, the participants of the program did not know the real function of these products.

Conclusion: It is necessary for every health professional to instruct diabetic people about the labels of these types of products, once their consumption is common in modernity and prescribed for this public.

No conflict of interest

P-1150

Evaluation of knowledge of the diabetics in doce desafio programme about nutritional facts label of light and diet products

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Introduction: The nutritional facts label is a mean through which consumers get to learn about the products they buy. Most of the target consumers of many companies are the diabetics. Diabetes Mellitus is a disease characterized basically by an absolute or relative deficiency of insulin. In spite of the technological advance of food industry and the popularity of Light and Diet products, there is a certain difficulty for interpreting the nutritional values from the nutritional facts label. As the healthy feeding is a fundamental factor for a good control of DM, the knowledge about the nutritional label is quite necessary. Objective: Evaluating the knowledge of diabetics about the nutritional label of diet and light products. Methodology: A transversal study made with diabetics from Doce Desafio Programme (Pragramme of Health Education and oriented Physical activities for diabetics/ Universidade de Brasília). Results: The data is composed by informations from 40 individuals, from 20 to 78 years of age (Avarage=59,30; DP= 13,43), with a period of 9 years of diagnosys (DP=8); 82,8% have coursed the High School; 57,5% (n=23) knew what a light product is, however 32,45% (n=13) thought that a light product is the one with a low level of fat or any fat if compared to the conventional product. Concerning the dietetic products, 15,3% (n=6), answered it is a product insent of a nutrient on its composition, and 64,4% (n=6) thought it was a special product for diabetics, believing it contains no sugar. 69,9% says the Diet and Light food nutritional label is hard to understand and when asked if there was any reduction of weight caused by the consumption of Diet and Light products, 52,25% (n=21) answered "sometimes"; 25,3% (n=10) answered "no" and 22,45% (n=9) answered "yes". In spite of the high schooling level, the participants of the programme did not know the real function of these products. Conclusion: It is necessary for every health professional to instruct diabetic people about the labels of these types of products, once their consumption is common in modernety and precribed for this public.

No conflict of interest

Oral glucose lowering therapies

P-1151

Clinical and preclinical profiles of DSP-7238: a potent enzyme/substrate-selective DPP IV inhibitor

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Aims: The aims of studies were to investigate preclinical profiles such as enzyme / substrate selectivity of DSP-7238. In addition, pharmacokinetics (PK), pharmacodynamics (PD) and tolerability of DSP-7238 after administration of single ascending doses to healthy subjects were assessed.

Methods: The inhibitory property was evaluated using plasma and recombinant enzyme with fluorogenic substrates. Substrate selectivity of each inhibitor was evaluated by mass spectrometer with the changes in molecular weight of peptide substrates by the release of the N-terminal dipeptides. In rats and monkeys, radioactivity was measured in urine and feces after oral dosing of

[^{14}C] DSP-7238 to asses the excretion profile. Phase I studies that characterized the PK, PD profiles and initial safety of DSP-7238 were conducted in healthy subjects.

Results: DSP-7238 competitively inhibited recombinant human DPP IV with Ki of 0.60 nM, but did not inhibit DPP IV-related enzymes including DPP8, DPP9, DPP II and fibroblast activation protein a, whereas vildagliptin (Vilda) and saxagliptin (Saxa) showed inhibitory potential on DPP8 and DPP9. Inhibition of GLP-1 degradation by DSP-7238 was more potent than that of IP-10 or SDF-1a degradation. In contrast, Vilda and Saxa showed comparable inhibition for all substrates tested. In rats and monkeys, following an oral administration of [^{14}C] DSP-7238, the cumulative urinary excretion of unchanged DSP-7238 up to 48 hr postdose was approximately 5%. As a primary elimination pathway is not associated with renal excretion, it is possible that a dose adjustment for the renal insufficiency is not required for DSP-7238, as cautioned for sitagliptin. In the clinical study, DSP-7238 was readily absorbed after a single oral dose. The geometric mean $t_{1/2}$ ranged from 17 to 32 hours. An E_{max} model was fitted to the data of DSP-7238 plasma concentration versus DPP IV inhibitory activity, estimating EC_{50}s for Caucasian and Japanese subjects to be 5.4 and 4.4 ng/mL, respectively. An 80% inhibition of DPP IV at 24 hours post-dose was observed after a single dose of DSP-7238 at 40 mg and above. Single doses of DSP-7238 were well tolerated and no severe or serious adverse events were reported at any dose.

Conclusion: These data suggest that DSP-7238 is a selective DPP IV inhibitor without potential concerns on adverse reactions caused by inhibitions of DPP8/9 or chemokine degradation. A once-daily dosing regimen for DSP-7238 is strongly supported by the PK/PD data with a long half-life and sustained inhibition of DPP IV activity.

Conflict of interest:

Employee: All authors are employee of Dainippon Sumitomo Pharma Co. Ltd., or Dainippon Sumitomo Pharma Europe Ltd.

P-1152

Patient characteristics are associated with prescription of sitagliptin vs. other oral antihyperglycemic agents based on an electronic medical record database from US

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Aims: This study examined differences in patient characteristics between patients with type 2 diabetes (T2DM) treated with sitagliptin (SITA) vs other oral antihyperglycemic agents (OAHA) in real-world practice in the US.

Methods: The General Electric Centricity electronic medical record database, covering 9 million US patients of all ages from 49 states, was used to select patients with T2DM, aged >=30 years, who received their first SITA, metformin, sulfonylureas, or thiazolidinediones prescriptions (Rx) as index Rx between Oct 2006 and June 2008. Included patients were new to OAHA mono, dual or triple therapy. Patient's demographics, diagnoses, Rxs, and lab results were extracted for the 1 year period (baseline) prior to index Rx. Baseline characteristics were stratified by mono, dual, or triple therapy and were compared between regimens with and without SITA. Adjusted logistic regression analyses were used to estimate odds ratio (OR) associated with SITA use in relation to patient characteristics.

Results: Among 45418 patients new to OAHA monotherapy, 1091 (2.4%) received SITA. Compared to patients initiating other OAHA, patients on SITA were older (64 vs 61 years), had higher HbA_{1c} (7.4% vs 7.1%) with fewer patients at HbA_{1c} <7% (46% vs 58%), had higher serum creatinine (106 vs 88 mmol/L), and had higher prevalence of macro- (18.1% vs 12.7%) and microvascular (15.1% vs 6.8%) conditions (all p<0.0001). Adjusted logistic regression shows that significant predictors of prescribing SITA were older age (OR 1.01, 95% CI 1.00, 1.02), higher HbA_{1c} level (OR 1.13, 95% CI 1.08, 1.18), and presence of retinopathy (OR 2.29, 95% CI 1.38, 3.80) or renal insufficiency (OR 2.65, 95% CI 2.20, 3.19). Of 24806 patients new to dual therapy, 2261 (9.1%) were on SITA regimens. Relative to patients on other dual regimens, patients prescribed SITA dual regimens were older, had higher serum creatinine, had higher prevalence of macro- and micro-vascular conditions, and greater use of lipid lowering and antihypertensive drugs (all p<0.0001). Among 10774 patients new to triple therapy, 3194 (29.6%) were on triple SITA regimens. Relative to patients on other triple regimens, patients on SITA triple regimens were older, had higher serum creatinine and greater use of antihypertensive or lipid-lowering drugs (all p<0.0001). Lipid lowering Rx was associated with higher adjusted likelihood of prescribing SITA dual and triple therapy.

Conclusion: This study found patients with T2DM who were prescribed SITA were older and likely to have more preexisting diabetic complications and comorbidities compared to patients receiving other common OAHA in real-world practice. This has important implications for future observational studies in that estimated outcome measures may be biased.

Conflict of interest:
Stock ownership: Q. Zhang, P. Mavros, S. Engel, D. Yin and L. Radican are owners of Merck stock.
Employee: Q. Zhang, P. Mavros, S. Engel, D. Yin and L. Radican are employed by Merck & Co.
Other substantive relationships: S. Rajagopalan is a paid consultant for Merck & Co.

P-1153

Sitagliptin and pioglitazone initial combination therapy in patients with type 2 diabetes provides substantial and durable incremental improvement in glycemic control over one year compared with initial treatment with pioglitazone monotherapy

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Aims: To assess the efficacy and safety of initial combination therapy with sitagliptin (SITA) + pioglitazone (PIO) compared with PIO monotherapy in drug-naïve patients (A1C 8–12%) with type 2 diabetes treated up to one year.

Methods: Following a 2-week, single-blind, placebo run-in, 520 patients (mean baseline A1C=9.5%) were randomized (1:1) to SITA 100 mg q.d.+ PIO 30 mg q.d. or PIO 30 mg q.d. + placebo for 24 weeks. Patients were eligible to enter a 30-week extension study if they had ≥75% study medication compliance during the base study, completed the base study on or after the initiation of the extension study, and consented to the extension study. The PIO dose in each treatment group was increased to 45 mg q.d. in the extension. Patients not meeting specific glycemic goals in the base study were discontinued. Patients not meeting specific glycemic goals in the extension were rescued with metformin therapy. Efficacy and safety results for the extension excluded data after initiation of rescue therapy.

Results: Of the 520 patients randomized, 446 completed the base study. In the base study, initial treatment with SITA+PIO compared with PIO monotherapy led to a mean reduction from baseline in A1C of -2.4% vs. -1.5%, respectively, at Week 24 (between-group difference = -0.9%, p<0.001). Significantly more patients in the SITA+PIO group vs. the PIO monotherapy group had an A1C <6.5% at Week 24 (38% vs. 14%, respectively; p<0.001). Mean reduction in fasting plasma glucose (FPG) was -63.0 mg/dL vs. -40.2 mg/dL, respectively (between-group difference = -22.8 mg/dL, p<0.001). Of the 446 patients who completed the base study, 317 entered the extension. In this cohort, the mean reductions from baseline in A1C and FPG at the end of the base study (Week 24) were -2.5% and -62.1 mg/dL with SITA+PIO vs. -1.9% and -48.7 mg/dL with PIO monotherapy, respectively. At the end of the extension (Week 54), the mean reduction in A1C was -2.4% with SITA+PIO vs. -1.9% with PIO monotherapy (between-group difference [95% CI] = -0.5% [-0.8, -0.3]) and the mean reduction in FPG was -61.3 mg/dL with SITA+PIO vs. -52.8 mg/dL with PIO monotherapy (between-group difference [95% CI] = -8.5 mg/dL [-16.3, -0.7]). Compared with PIO monotherapy, initial treatment with the combination of SITA+PIO was similarly well tolerated. As expected, mean increases in body weight from baseline were observed in both treatment groups at Week 54: 4.8 kg and 4.1 kg in the SITA+PIO and PIO monotherapy groups, respectively (between-group difference [95% CI] = 0.7 kg [-0.7, 2.1]).

Conclusion: One-year treatment with initial combination therapy with sitagliptin and pioglitazone compared with initial treatment with pioglitazone monotherapy led to a substantial and durable incremental improvement in glycemic control. Compared with pioglitazone monotherapy, initial combination therapy with sitaglipin and pioglitazone was similarly well tolerated.

Conflict of interest:
Stock ownership: Teng, Golm, Thakkar, Meehan, Wiliams-Hernan, Kaufman, Amatruda, Steinberg
Employee: Teng, Golm, Thakkar, Meehan, Wiliams-Hernan, Kaufman, Amatruda, Steinberg
Commercially-sponsored research: Shockey

P-1154

Assessment of usage of oral antidiabetic drugs in patients with type 2 diabetes mellitus in the Asia Pacific region: results from REASON-AP study

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Background: The prevalence of type 2 diabetes mellitus (T2DM) is increasing across the world with the greatest increase expected in developing countries especially of the Asia-Pacific region. This presents a great health care challenge.
Aim: The REASON-AP study assessed the management of T2DM patients (pts) with widely available oral antidiabetic (OAD) agents.
Methods: This multinational observational study comprised 2 parts: 1) cross-sectional study assessing demographics and baseline characteristics and 2) longitudinal study evaluating 6 months follow-up of sulfonylurea (SU) treated pts. Inclusion criteria: Pts with T2DM newly diagnosed (OAD naive) or currently treated with a single OAD for <6 months but inadequately controlled, age >21yrs.
Results: Pts were enrolled at 76 centres in Bangladesh, Indonesia, Philippines, Pakistan and Thailand. Data for 1487 pts were analyzed for the cross sectional study. Newly diagnosed: 75.9%; Males: 46.7%; Mean age: 52.0±11.6 years (males 50.7, females 53.2); Mean BMI: 25.47±4.03 for males, 26.09±4.59 kg/m^2 for females; Central obesity: 59.1% males, 84.7% females; Mean ABP: 131/81 mmHg; Hypertension: 43.8% (87.6% treated, 57.9% with ACEi/ARB); ABP <130/80: 24.1%; Dyslipidaemia: 60.5%; Mean diabetes duration: 1.1yrs; Previously received OAD: 21.8% (58.3% received SU and 47.2% received biguanide); Mean HbA_{1c}: 9.84±2.40%; Mean FBG: 203.2±76.5mg/dL. 1066 pts entered the longitudinal phase of the study at T_0, and 830 attended the 6 month visit at T_6. At T_0, 99.8%, 42.7%, 2.7% and 0.5% pts received SU, biguanide, TZD and alpha glucosidase inhibitors; at T6, the rates were 97.1%, 56.6%, 5.1% and 1.5%. SUs used at T_0: glimepiride 40.2%, glipizide 24.1%, glibenclamide 21.4%, gliclazide 11.2%, others 3.1%. Treatments were generally altered and doses titrated similarly during the first 3 months of follow up and in the latter 3. Mean SU doses increased between 21% (glimepiride) and 46% (glipizide). Compliance was generally high throughout. Mean HbA_{1c} decreased significantly from 10.24% at baseline to 7.28% at T_6, with a decrease of over 2.5% by T_3 and a further decrease at T_6.

HbA1c (%)				
	N	Mean	Change	p
T_0 to T_3	829	10.18 to 7.65	-2.53	<0.0001
T_3 to T_6	755	7.62 to 7.26	-0.35	<0.0001
T_0 to T_6	742	10.24 to 7.28	-2.96	<0.0001

The percentage of pts with HbA_{1c}<7% increased over time: 4.5%, 32.9% and 46.8% at T_0, T_3 and T_6. A similar pattern of changes was noted with FBG with a decrease from T_0 to T_6 of 76.0 mg/dL (p<0.0001). The major reasons for not achieving target HbA_{1c} were poor diabetes education 51%, non-compliance 21% and fear of hypoglycemia 20% although the incidence of hypoglycemia was very low 1.1%
Conclusion: The REASON-AP study showed that marked reductions in HbA_{1c} and FBG are achievable for T2DM pts using widely available OADs. However, patient education and compliance to anti-diabetic therapy are essential for effective management.

Conflict of interest:
Employee: S.K. Aggarwal is an employee of sanofi-aventis

P-1155

Metformin regulates immune activity of natural killer (nk) cells of type 2 diabetic patients by influencing the cellular glucose transport (CGT)

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Background and aims: Impairment of CGT is involved in the pathogenesis of diabetic hyperglycaemia and may suppress the function of peripheral blood NK cells. Significant differences in glucose transport and immune activity of NK cells of prediabetic patients in comparison to healthy subjects have been shown. The aim of this study was to evaluate the number and activity of NK cells obtained from type 2 diabetic patients (T2DP) before and after the administration of metformin, and to determine the CGT in these cells.
Materials and methods: The study group included 12 newly-diagnosed T2DP, naive to any hypoglycaemic drugs and 13 matched control subjects; in the diabetic patients, the cytotoxicity tests and glucose uptake experiments were repeated after 6 months of therapy with metformin accordingly to clinical indications. Peripheral blood mononuclear cells (PBMC) were isolated by Ficoll gradient centrifugation. Immunofluorescent phenotyping of NK (CD16+/CD56+) cells in PBMC was performed using specific murine anti-human CD16 PE-conjugated monoclonal antibodies. The K562 human erythroleukemia cell line was used as the standard target for human NK cytotoxicity assay. After 4 hours of incubation, data were collected for analysis on the Becton-Dickinson FACScalibur flow cytometer. The data was analyzed using Cell Quest software. Glucose transport was monitored with deoxy-D-glucose (2-[^{3}H (G)]). At previously assigned time points (15, 30, 60 minutes of incubation) deoxy-D-glucose uptake was stopped and its concentration in the cells was measured by scintillation counting.
Results: The significant differences were revealed between deoxy-D-glucose transport in NK cells obtained from T2DP and the control group (P<0.01). The mean values of 4564 ccpm at 15 min. 9423 ccpm at 30 min. and 12860 ccpm at 60 min. were obtained in NK cells of healthy subjects. The glucose uptake was, respectively, 2063 ccpm, 4328 ccpm and 7790 ccpm in NK cells of T2DP before metformin therapy. The T2DP at baseline in comparison to healthy subjects had an increased number (13,35±6,0% vs 9,63±4,7%) but decreased activity (3,1±2,2% vs 9,2±3,7%) of NK cells (P<0.01). Treatment with metformin resulted in a statistically significant reduction in fasting plasma glucose of 1.65 mmol/L (P<0.001) and in HbA_{1C} of 0.82% (P<0.001). After 6 months of metformin therapy the significant increase in glucose uptake (mean values of 4296 ccpm at 15 min. 8721 ccpm at 30 min. and 11755 ccpm at 60 min.) by NK cells of T2DP was found (p<0.01). The T2DP after metformin administration demonstrated substantially decreased number and increased activity of NK cells when compared to the baseline conditions (10,83±4,6% and 5,7±2,8% respectively vs 13,35±6,0% and 3,1±2,2%).
Conclusion: Diabetic hyperglycaemia may be the cause of increased number and decreased activity of NK cells of T2DP. Metformin therapy improves NK cell cytotoxicity in Type 2 diabetes by regulating the CGT. The CGT seems to be one of the mechanisms influencing the NK cell killing function and therefore may be regarded as a target for the action of antidiabetic therapy.

No conflict of interest

P-1156

Metabolic and insulin resistance-related indices during pioglitazone and vildagliptin association versus glimepiride and vildagliptin association in type 2 diabetic patients

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Aims: The aim of our study was to verify the effects of pioglitazone (P) and vildagliptin (S) association vs glimepiride (G) and vildagliptin (V) association on metabolic and insulin resistance related-indices in type 2 diabetic patients.
Methods: Ninety-one type 2 diabetic patients with uncontrolled type 2 diabetes mellitus (HbA1c > 7.5 %) were randomised to P 30 mg o.d. and V 50 mg b.i.d. or to G 2 mg t.i.d. and V 50 mg b.i.d. All type 2 diabetic patients were resulted not well controlled with diet and physical activity and P at dosage of

30 mg/day and G at dosage of 6 mg/day. The treatment period had a 9 months duration. We evaluated BMI, HbA1c, FPG, PPG, FPI, Homa index and collected plasma samples of adiponectin (ADN), resistin (R), tumor necrosis factor-alpha (TNF-a), and high-sensitivity C reactive protein (Hs-CRP) at baseline, and after 9 months. Eighty-four patients completed the study (42 in PV and 42 in GV group).

Results: Eighty-six patients completed the study (44 in PV and 42 in GV group). BMI does not change in both groups. HbA1c was decreased by 1.3±0.08 % (p< 0.01), and by 1.3±0.08 % (p< 0.01); FPG was reduced by 20±4 mg/dl (p< 0.01), and by 23±5 mg/dl (p< 0.01); PPG was decreased by 36±8 mg/dl (p< 0.01), and by 44±9 mg/dl (p< 0.01), in PV and GV group, respectively. FPI was decreased by 2.3±0.1 mU/ml (p< 0.05, p< 0.05 vs GV), and by 0.4±0.03 mU/ml (p< 0.05), and Homa index by 1.7±0.6 (p< 0.01 vs baseline, p< 0.05 vs GV), and by 1.1±0.4 (p< 0.05) in PV and GV group, respectively. ADN was increased by 0.9±0.01 mg/ml (p< 0.05 vs baseline, p< 0.05 vs GV), and by 0.2±0.002 mg/ml (ns vs baseline), in PV and GV group, respectively. Resistin was reduced by 1.1±0.1 ng/ml (p< 0.05 vs baseline, p< 0.05 vs GV), and by 0.1±0.001 ng/ml (ns vs baseline), TNF-a by 0.9±0.2 ng/ml (p< 0.05 vs baseline, p< 0.05 vs GV), and by 0.1±0.001 ng/ml (ns vs baseline), and Hs-CRP by 0.8±0.007 mg/l (p< 0.05), and by 0.7±0.005 mg/l (p< 0.05), in PV and GV group, respectively. There was a significant correlation between Homa index decrease and ADN increase (r= -0.49, p< 0.01), R decrease (r= 0.52, p< 0.01), and TNF-a decrease (r= 0.54, p< 0.01).

Conclusion: Both combinations ameliorated diabetes control, but only PV improved insulin resistance related-parameters. The ADN increase, R and TNF-a decrease seem to be related to Homa index improvement.

No conflict of interest

P-1157

Pioglitazone improves 2-hour glucose level after OGTT in patients with type 2 diabetes

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Aims: Increased postprandial glucose (PPG) contributes to hyperglycemia in patients with type 2 diabetes, and may be associated with an increased risk of cardiovascular disease. Effective control of PPG is especially important in early-stage disease when PPG contributes significantly to the elevation of HbA1c (A1C). Pioglitazone is an oral antidiabetic agent that lowers plasma glucose by improving insulin sensitivity. Several studies have shown that pioglitazone reduces the total incremental glucose exposure during the oral glucose tolerance test (OGTT), suggesting it may also improve PPG. We pooled the OGTT data from four studies and examined the effect of pioglitazone on the 2-hour OGTT glucose level, a commonly used indicator for peak PPG.

Methods: Data were pooled from 4 similar studies (Quartet, total n=3713 patients): 2 pioglitazone monotherapy studies comparing with metformin or gliclazide, respectively; 1 study of add-on therapy to metformin comparing pioglitazone with gliclazide, and 1 study of add-on therapy to gliclazide comparing pioglitazone with metformin. The data were deemed poolable due to similarity of the studies in duration (52 weeks), drug dosages, patient population, and endpoints. Only patients who had baseline and 52-week OGTT data were included. Statistical analysis used two-way ANOVA with study, treatment, and study-by-treatment interaction as factors.

Results: Baseline characteristics were similar between the pioglitazone (titrated up to 45 mg/d) treatment group and the comparator group (metformin titrated up to 2550 mg/d or gliclazide titrated up to 320 mg/d), and there was no difference in 2-hour OGTT, A1C, or fasting plasma glucose (FPG) between the two groups at baseline. At 52 weeks, all glucose parameters were significantly reduced from baseline in the pioglitazone and comparator groups (Table). The reduction of 2-hour OGTT with pioglitazone was significantly greater (by 1.6 mmol/L, P<0.0001) than with comparator treatment, and this was consistent with the results of each individual study. The differences in A1C reduction and FPG reduction between pioglitazone and the comparators, however, were not significant (P>0.05).

	Pioglitazone	Metformin or Gliclazide
2h OGTT (mmol/L)	n=694	n=682
Baseline	19.2	19.3
Change at 52 weeks	-4.1* †	-2.5*
A1C (%)	n=652	n=646
Baseline	8.7	8.6
Change at 52 weeks	-1.4*	-1.4*
FPG (mmol/L)	n=652	n=646
Baseline	11.3	11.3
Change at 52 weeks	-2.2*	-2.1*

*Data are LS means. *P<0.05 vs baseline; †P<0.0001 between treatment groups.*

Conclusion: Pioglitazone significantly reduces PPG, as shown by the 2-hour OGTT measurement, in 52 weeks. While achieving similar A1C and FPG reduction, pioglitazone demonstrated greater reductions in PPG than metformin and gliclazide.

Conflict of interest:
Employee: J. Liu and R. Spanheimer are employees of Takeda Pharmaceuticals North America. M. Raanan and A. Perez are employees of Takeda Global Research & Development Center, Inc.

P-1158

Improvement of glycemic control via reducing insulin resistance with pioglitazone and metformin fixed-dose combination therapy

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Insulin resistance is a core defect in the development of type 2 diabetes mellitus (T2DM). Pioglitazone, a thiazolidinedione, improves glycemic control primarily by reducing insulin resistance (IR), which can be quantified by homeostatic model assessment (HOMA), whereas metformin, a biguanide, exerts its effect primarily by decreasing hepatic glucose output. A fixed-dose combination (FDC) of pioglitazone and metformin would have complementary mechanisms to improve glycemic control in T2DM. This randomized, double-blind, parallel-group study evaluated the effects of initial therapy with FDC pioglitazone/metformin compared with the effects of each drug alone on efficacy and safety in T2DM patients. These patients were receiving no antidiabetes medications for 12 weeks and had a stable hemoglobin A1c (A1c) >/=7.5% but
A1c showed a significant decrease from Baseline in all 3 study groups at Week 24 (P<0.0001 compared with Baseline of respective group). A1c reduction was –1.83% for FDC from Baseline 8.89% vs –0.96% and –0.99% for pioglitazone monotherapy from Baseline 8.69%, and metformin from Baseline 8.65%, respectively, demonstrating nearly additive reduction effects of the FDC relative to pioglitazone and metformin monotherapies (P<0.0001 compared with FDC). There were no significant differences in hypoglycemic event rate (1.0%, 0.5%, and 1.4% for FDC, pioglitazone, and metformin, respectively).
Mean decreases from baseline in HOMA-IR (Baseline mean = 6.3, 7.0, and 6.4 for FDC, pioglitazone, and metformin, respectively) were observed across all 3 treatment groups. A significant decrease in HOMA-IR was observed Week 16 through 20 for the pioglitazone/metformin FDC, which was comparable to pioglitazone monotherapy, with a smaller decrease observed in the metformin group. At Final Visit (Week 24), the greatest decrease from Baseline in HOMA-IR was observed in pioglitazone/metformin FDC treatment (–2.7) and pioglitazone (–2.1) monotherapy, compared with metformin (–1.1) monotherapy. Treatment-emergent adverse event incidences were similar across all 3 study groups, with 50.7% for pioglitazone/metformin FDC, and 52.1% and 53.1% for pioglitazone and metformin monotherapy, respectively. In summary, the improvements in A1c and HOMA-IR were greatest in pioglitazone/metformin FDC and pioglitazone monotherapy, with the major contributing factor of the FDC effect due to pioglitazone.

Conflict of interest:
Employee: R. Spanheimer is an employee of Takeda Pharmaceuticals North America. Z. Zhao and A. Perez are employees of Takeda Global Research & Development Center, Inc.

P-1159

Vanadium addition into diet of patients with diabetes mellitus

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Aims: Vanadium compounds show an insulin mimetic effect and used in treatment of insulin resistance in patients with type 2 Diabetes Mellitus (2DM). The aim of investigation was study the glycemia and HOMA indexes and biochemical markers after vanadium supplementation in diet of patients with DM2.
Methods: In 12 patients with DM2, blood glucose fasting (FG) and 2 hour after breakfast (2HG), HbA1c, CRP, plasma insulin (PI), erythrocytes sialidase activity (ESA), serum nitrites and nitrates level (NN), blood lipids as total cholesterol (TC), triglycerides (TG), LDLP, HDLP level were measured and insulin resistance index HOMA was calculated as (FG x PI): 22.5 before and after drink mineral water contained 500 mkg vanadium every day during 2 months. Other 8 DM2 patients and 11 healthy subjects (HS) observed in same times and present control groups.
Result: In DM2 patients, blood FG, 2HG, HbA1c level, TC, TG, LDLP, HDLP, CRP, ESA was significantly increased in compare with HS and suggested poor glycemic control and sufficient biochemical abnormalities. After 2 months not any significant differences were detected between DM2 groups with and without vanadium supplementation for FG, 2HG, HbA1c level, but blood CPR, LDLP level, ESA and HOMA index substantially decreased and NN, HDLP level increased in DM2 patients after vanadium supplementation compared with control DM2 group. The data shown that glycemia indexes not differ in this period but biochemical markers which reflected tissue damage and insulin resistance significantly improved in DM2 after vanadium supplementation and may be useful for preventing of complication.
Conclusion: Addition vanadium into diet of patients with type 2 DM during 2 months improved insulin resistance and tissue damage markers.

No conflict of interest

P-1160

Metformin inhibits the expression of antioxidant enzymes in non-diabetic male wistar rats

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Metformin (MET) hydrochloride is widely used to lower glucose levels by decreasing hepatic glucose production in type 2 diabetes. The present study was designed to examine the effect of therapeutic dose of MET on the hepatic antioxidant enzymes in normal male Wistar albino rats. Twenty-four non-diabetic rats were divided into 4 groups; group I (control) received distilled water, group II received MET alone, group III received both MET and vitamin C (VC) and group IV received VC alone. MET was given at a therapeutic dose of 21.4 mg/kg body weight (bd wt) and VC at 100 mg/kg bd wt. MET and VC were given for seven consecutive days by oral gavage. Experimentally, therapeutic dose of MET enhanced oxidative stress as evidenced by elevated levels of hepatic malondialdehyde (MDA) in the treated animals. Precisely, MET caused 73% elevation of MDA in test animals when compared to controls. Furthermore, administration of MET caused significant decrease ($p< 0.05$) in hepatic reduced glutathione (GSH), glutathione-s-transferase (GST) and superoxide dismutase (SOD) levels by 48%, 58% and 42%, respectively when compared to controls. However, there were no significant differences ($p> 0.05$) in the levels of serum aminotransferases, alkaline phosphatase and catalase of MET-treated rats when compared to controls. In addition, co-administration of VC during MET therapy significantly ameliorated MDA, GSH and SOD levels in the treated animals. These findings suggest that MET could enhance oxidative stress and may adversely affect the expression of antioxidant enzymes in animals. Antioxidant supplementation may be advisable during MET treatment.

No conflict of interest

P-1161

Thiazolidinedione precipitated thyroid associated ophthalmopathy

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Background: Thyroid associated ophthalmopathy (TAO), a cardinal clinical pointer to diagnose Graves' disease (GD), is seen less frequently in our country than in the West, but can have sight threatening consequences. Smoking, diabetes, male gender, increasing age and radioactive iodine treatment for thyrotoxicosis are known precipitating factors for TAO. A recent addition to the list is thiazolidenediones (TZD). We report four cases of TZD precipitated TAO. Cases:

	Age/ Sex	Duration of T2DM	Thyroid diagnosis	Thyroid status at presentation & current treatment	TMA TGA	Diagnosis of TAO after TZD
Case 1	55/ M	5 years	Graves'	Euthyroid with Antithyroid drugs	+ve/ +ve	6 months
Case 2	46/ M	6 months	Graves' 5yrs back	Euthyroid, no treatment	+ve/ +ve	3 months
Case 3	63/ M	5 years	Graves' 5yrs back	Euthyroid, no treatment	+ve/ +ve	6 months
Case 4	60 /M	8 years	Hashimoto's Thyroiditis	Euthyroid, on Thyroxine	+ve/ +ve	3 months

Discussion: Expression of TSH-receptor and adipogenesis in orbit is well documented in Graves' disease. TZD is known to enhance adipogenesis. PPAR-gamma activation by TZD has been shown to stimulate functional TSH-receptor expression and to induce recruitment and differentiation of orbital fibroblasts into mature lipid-laden adipocytes. Thus, TZD can exacerbate TAO; we clinicians need to keep this in mind in treating patients with T_2DM. Further research is required to establish and prove the role of TZDs in TAO. Meanwhile, we suggest TZDs better be avoided for patients with T_2DM with active Graves' disease and in people with autoimmune thyroid disease.

No conflict of interest

P-1162

Effect of sibutramine in combination with L-carnitine in comparison with sibutramine as monotherapy on adiposity and insulin sensitivity in obese women

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Aim: To evaluate the effect of sibutramine in combination with L-carnitine in comparison with sibutramine as monotherapy, on adiposity and insulin sensitivity in obese women.
Methods: A randomized, double-blind, clinical trial was carried out in 13 adult (20-50 years old), obese [body mass index (BMI) 30-40 kg/m^2] women. Volunteers received sibutramine (15 mg) with L-carnitine (600 mg) in a single pharmacological presentation or sibutramine 15 mg once a day during 3 months. Before and after the pharmacological intervention, weight, BMI, waist circumference (WC), % adiposity, blood pressure, uric acid, lipid profile and insulin sensitivity (IS) were measured. % adiposity was evaluated with bioimpedance analysis and IS was assessed by the insulin tolerance test (ITT). Statistical analyses were performed with Mann-Whitney U and Wilcoxon tests.
Results: Both, sibutramine and sibutramine with L-carnitine decreased weight [85.9 (64.3-111.6) vs. 78.9 (61.8-99.2) kg, $p = 0.02$ and 94.0 (79.4-98.2) vs. 86.2 (71.5-91.4) kg, $p = 0.01$; respectively], BMI [33.3 (31.0-38.6) vs. 31.7 (26.1-35.9) kg/m^2, $p = 0.02$ and 34.7 (31.7-36.1) vs. 31.7 (29.5-34.0) kg/m^2, $p = 0.01$; respectively] and WC [98 (91-115) vs. 92 (87-102) cm, $p = 0.02$ and 105 (91-110) vs. 93 (84-100) cm, $p = 0.01$; respectively]. Furthermore, sibutramine reduced adiposity [43.0 (34.5-51.9) vs. 39.4 (32.7-45.8)%, $p = 0.02$] diastolic blood pressure and uric acid concentration. Pharmacological interventions did not modify the lipid profile and IS.
Conclusions: Sibutramine and sibutramine with L-carnitine reduced weight, BMI and WC. Sibutramine as monotherapy reduced adiposity, diastolic blood pressure and uric acid concentration. There was no modification in IS with the interventions.

No conflict of interest

P-1163

Sustained release metformin improves glycemic control in type 2 diabetes mellitus patients with poor adherence to immediate release metformin

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Background: To evaluate the difference in adherence to immediate release metformin (metformin IR) and sustained release formulation (metformin SR) and the role of metformin SR in metformin therapy in general practice.
Study design: Retrospective observational cohort study from a prospectively structured diabetes mellitus care recorded database.
Methods: General surveys before and after changing metformin formulation from the IR form to metformin SR were performed. The glycemic control at 2 and 4 months after changing to metformin SR were compared with the baseline data when metformin IR was used. The relationship between metabolic changes and adherence to metformin was analyzed.
Results: Thirty-seven (13.3%) patients had poor adherence to metformin IR therapy. Patients with poor adherence to metformin IR had higher HbA1c (8.65 ± 1.43 vs. 8.08 ± 1.20, p<0.01). After replacing metformin IR with SR, the difference of the changes in HbA1c between the groups (+0.18% ± 0.64% for the good adherence group vs. -0.15% ± 0.61% for the poor adherence group, p<0.01) is statistically significant.
Conclusion: The percentage of poor adherence to metformin therapy is high in general practice. Improving adherence to metformin therapy may associate with better HbA1c. By improving adherence, metformin SR can improve glycemic control in those patients with poor adherence to metformin IR therapy.

No conflict of interest

P-1164

Pioglitazone, but not ramipril reduces cardiovascular risk in non-diabetic patients with hypertension

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Background: The acute-phase protein CRP, when measured with a highly sensitive assay (hsCRP), has been identified as a predictive marker for cardiovascular (CV) risk. The generally accepted stratification identifies patients with values from 0-1 mg/L to have a low risk, from 1-3 mg/L to have a moderate risk, and from 3-10 mg/L to have a high risk. Values > 10 mg/L may indicate unspecific inflammatory conditions and should not be used for cardiovascular risk assessment. It has been shown that non-diabetic patients with hypertension or dyslipidemia may suffer from vascular insulin resistance contributing strongly to their CV risk. The aim of this analysis was to investigate the effects of pioglitazone (PIO), ramipril (RAM) or their combination (PIRA) on the CV risk stratification in hypertensive non-diabetic patients.
Methods: This placebo-controlled, double-blind, multicentre, randomized, parallel study was performed with 149 non-diabetic patients (72 male, 77 female, age: 60±9 yrs., BMI: 30.4±4.7 kg/m^2, duration of hypertension: 9±8 yrs.). Patients were treated with 15/30 mg PIO (dose titration), 2.5/5 mg RAM or a combination thereof for 12 weeks. A CV risk stratification using the hsCRP concentration was performed at baseline and after 3 months.
Results: A pronounced and general improvement of the mean (±SD) hsCRP-value was seen with PIO (baseline: 3.54±2.54 mg/L vs. endpoint: 2.65±2.02 mg/L, p<0.01) and PIRA (2.98±2.15 mg/L vs. 2.50±1.98 mg/L, p<0.05), but not with RAM (2.90±2.26 mg/L vs. 3.47±2.62 mg/L, n.s.). This resulted from 69 % (PIO) and 66 % (PIRA) patients with lower hsCRP values at endpoint (RAM: 46 %). Consequently, 29 % (PIO) and 45 % (PIRA) shifted to a better risk group (worsening in 6 % and 13 %, respectively). While 11 % showed an improved risk profile with RAM, 23 % shifted to a higher risk group.
Discussion and conclusion: Activation of PPARg by pioglitazone but not ACE-inhibition by ramipril leads to an improved cardiovascular risk profile in non-diabetic hypertensive patients. These results point to an important role of insulin resistance in cardiovascular risk development in non-diabetic patients with hypertension. Further research efforts are encouraged by our findings to confirm a positive effect of pioglitazone on cardiovascular outcome in non-diabetic patients with vascular insulin resistance.

Conflict of interest:
Paid lecturing: Takeda Pharma: A. Pfützner, T. Forst
Advisory board: Takeda Pharma: A. Pfützner, T. Forst
Employee: Takeda Pharma: I. Kleine, W. Fuchs
Commercially-sponsored research: Takeda Pharma: A. Pfützner, T. Forst

P-1165

Pharmacological remission in newly-diagnosed type 2 diabetes patients using metformin and pioglitazone

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Aim: When a combination of pioglitazone (PG) and metformin are used in newly-diagnosed type 2 diabetes mellitus (DM) patients, they could help preserve beta-cell function and also simultaneously reduce insulin resistance. Theoretically, this combination could possibly reverse the diabetic state to a normoglycemic state and help to maintain long term pharmacological remission. Our study aimed to validate this hypothesis.
Methods: We prospectively studied 50 newly-diagnosed (<2 years) type 2 DM patients (33 males, 17 females) from our clinics over 1 year. Patients were not selected if they had any cardiac, renal or liver dysfunction; or if they consumed >60 ml/day of alcohol or had any allergy to the drugs used. The patients received a combination of MF (500mg, td) and PG (15mg, od) and gliclazide (GC) (80mg, titrated individually). All were also advised by a dietitian and regular exercise of brisk walking (40 minutes/day or 200 minutes/week) was prescribed. Patients were followed-up at monthly intervals with fasting blood sugar (FBS) and post-prandial blood sugar (PPBS). Patients were asked to report hypoglycemia on telephone, and GC dose was reduced accordingly. The dose of gliclazide was titrated based on the glycemic values every month. MF was continued at the full dose except in those who could not tolerate the full dose, in whom dose was reduced. Values are presented as mean±SD where applicable. Before-after comparisons were made using the paired t-test.
Results: (Table 1) There were no serious adverse events reported and no dropouts during the course of the study. At enrollment, the mean age was 48.07±10.6 years. In 43 patients (86%), glycemic control was maintained >2 months after stoppage of gliclazide (remission group); and gliclazide could not be stopped in the remaining 7 patients (non-remission group; 6 males, 1 female). The mean time required to achieve this remission was 3.0±1.81 months.

Table: Parameters under study

	Baseline	At 1 year	P value
FBG*	196.6± 70.7	105.9±22.7	<0.01
PPBG*	295.44± 103.4	139±39.0	<0.01
HbA1c (%)	9.41± 2.9	5.66±0.7	<0.01
Weight (kg)	72.7± 15.0	74.4± 15.9	>0.05
BMI (kg/m^2)	27.91± 5.7	28.76± 7.0	>0.05

FBG, fasting blood glucose; PPBG, post-prandial blood glucose; HbA1c, glycated hemoglobin; BMI, body-mass index
** Units: mg/dl*

Discussion: The study validates the concept that, once glutotoxicity abates, a combination of insulin sensitizers can sustain and maintain euglycemia in type 2 DM. We have termed this as "pharmacological remission" based on the lack of need to augment insulin production or supplement exogenous insulin. Our study provides evidence to support use of combination of MF, PG and GC in newly-diagnosed type 2 DM patients for improving glycemic control.

No conflict of interest

P-1166

Relationship between pioglitazone dose, weight gain and glycemic control in recently-diagnosed type 2 diabetes patients

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Aim: Pioglitazone (PG) is an extremely useful agent in the treatment of type 2 diabetes mellitus (DM) through its actions on insulin resistance. However, fluid retention and its association with heart failure remain important adverse effects of this drug. We studied the relationship between PG dose, the resulting weight gain and glycemic control in recently-diagnosed type 2 DM patients.
Methods: A total of 300 patients were prospectively selected over 6 months from our clinics. According to the selection criteria, the patients had recent-onset type 2 DM (<2 years), were 30-80 years old, of either sex, were not receiving insulin therapy and had no concurrent hepatic, cardiac or renal dysfunction. Patients were randomly assigned to 3 groups of 100 patients each:
Group 1: Low-dose PG (7.5 mg/day)
Group 2: Standard-dose PG (15 mg/day)
Group 3: High-dose PG (30 mg/day)
Fasting blood sugar (FBS), post-prandial blood sugar (PPBS) and glycated hemoglobin (HbA1c) were measured at baseline and were followed-up every 2 months for 6 months. The paired t-test was used to compare results before and after the study and Student's t-test was used for inter-group comparisons.
Results: From the 3 groups, 78, 71 and 89 patients completed the study from the low, standard and high dose groups, respectively. The remaining patients were lost to follow-up. In all three groups, glycemic parameters (FBS, PPBS and HbA1c) showed significant reductions at 6 months ($P<0.05$ for each) (Table 1). A significant weight gain was observed in all groups at the end of 6 months. However, the magnitude of weight gain was maximum in group 3, intermediate in group 2 and least in group 1. Group 3 had a higher HbA1c at 6 months ($p<0.05$). Baseline HbA1c in group 3 was higher than groups 1 ($P<0.05$) and 2 ($P=0.2$).

Table: Findings from the study

		Group 1	Group 2	Group 3
Number		78	71	89
Age		57.65±11.72	55.93±10.72	54.12±8.14
Male/female		40/38	37/34	50/39
FBS (mg/dl)	Baseline	139.84±47.43	132.84±32.09	143.98±40.87
	At 6 months	120.08±31.83	113±21.62	122.73±29.99
PPBS (mg/dl)	Baseline	198.19±50	213.14±43.74	198.3±43.58
	At 6 months	164±51.85	171.47±48.31	163.13±36.82
HbA1c (%)	Baseline	7.4±0.56	7.6±0.46	7.7±0.66
	At 6 months	6.2±0.39	6.3±0.46	6.5±0.38
Weight (kg)	Baseline	73.72±15.13	69.65±12.38	68.9±13.37
	At 6 months	74.98±15.94	71.47±12.55	71.56±13.53

Figures written as mean ± SD
Discussion: Higher doses of PG caused a greater weight gain compared to lower doses. Group 3 had greater HbA1c at 6 months despite a higher PG dose. However, the baseline HbA1c in this group was also higher than the other two groups. Also, all groups satisfactorily reached the glycemic goal of HbA1c<7%. The fluid retention associated with PG may be dose-dependent, while the glycemic target is reached at all doses. In recently-diagnosed patients, it may be more prudent to start with a lower dose of PG to avoid adverse effects such as fluid retention and weight gain.

No conflict of interest

P-1167

The impact of thiazolidinedione controversy on the prescription patterns in India

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Aim: The publication of meta-analysis in New England Journal of Medicine in June 2007 implicating association of rosiglitazone with 43% increase in the risk of acute myocardial infarction and 64% increase in the risk of cardiac death in type 2 diabetic patients led to a major controversy regarding rosiglitazone in particular and thiazolidinediones in general, resulting in reduced use globally. In India more than 90% of diabetic patients are treated by the general practitioners whose exposure to the latest medical literature and conferences and seminars in the field of diabetology is limited. Thus we decided to study the impact of the controversy on the prescription trends.
Methods: We studied the Rupee value sales of rosiglitazone, pioglitazone and their combinations in the data generated by ORG for the period from June 2006 to May 2007 and compared with those in next twelve month period from June 2007 to May 2008. We interviewed 42 doctors.
Results: Sales of pioglitazone grew by 11%, those of rosiglitazone declined by 9%. As regards thiazolidinedione combinations with metformin, the sales of pioglitazone - metformin combination grew by 12% while sales of rosiglitazone - metformin combination declined by 3%. The pharmaceutical industry grew by 13% while anti diabetics grew by 25%. The growth rate of pioglitazone and its combination with metformin was significantly lower than that of total anti diabetics while rosiglitazone and its combination with metformin had negative growth. 11% doctors were unaware of the safety concerns on rosiglitazone while 30% were under the impression that thiazolidinediones were banned in western countries following the safety concerns. 40% doctors stated that they still use these medications but after carrying out thorough scrutiny.
Discussion: Even though an average Indian practitioner has far less exposure to the latest trends in medical literature, the concerns regarding safety of thiazolidinediones in general and rosiglitazone in particular were picked up quickly by them resulting in decline in their prescriptions. The relatively lesser decline of thiazolidinedione-metformin combinations as compared to the individual agents was intriguing. Multiplicity of branded anti diabetic combinations [205 brands were listed in Advanced Drug review December 2006- March 2007 issue] leading to confusion in prescriber's mind regarding the exact formula of the prescribed brand could be one of the reasons.

No conflict of interest

P-1168

Clinical effects of additional use of pioglitazone in diabetic patients receiving treatment at our outpatient clinic

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Objective: To investigate the effects of combined therapy with pioglitazone on the basis of prescription records of patients receiving treatment at our outpatient clinic.
Methods: In order to examine the changes in the levels of HbA1c, LDL, HDL, and TG and in body weight at 0, 12, and 24 weeks, pioglitazone (7.5-30mg) was given additionally to 256 diabetic outpatients (the diet therapy group [D group: n=41], the insulin therapy group [I group: n=41] and the oral administration group [O group: n=174]) who did not respond to drug therapy using antidiabetics and lipid metabolism-improving agents.
Results: The levels of HbA1c, HDL, and TG improved significantly ($p<0.001$), although there was an increase in weight. No improvement was observed in the level of LDL. According to the type of the treatment for diabetes, an improvement was achieved at 12 weeks in the I group and the O group, while it was observed at 24 weeks in the D group. According to the degree of obesity, a decrease was observed in TG in the obese group. For the type of lipid metabolism-improving agents (the group without treatment [N group, n=155], the statin group [S group, N=74], and the fibrate group [F group, n=27]), an increase in weight and an improvement in A1c were observed in all the groups. With respect to the difference between sex, the level of A1c decreased by 0~12 weeks in females (n=135) and by 0~12~24 weeks in males (n=121).
Conclusions: The additional administration of pioglitazone contributed to a significant decrease of HbA1c, an increase in HDL and a decrease in TG at 0~24 weeks, respectively, although it was accompanied by an increase in weight. It was shown to be effective both in improving blood sugar control and in inhibiting the progress of arteriosclerosis.

No conflict of interest

P-1169

Monosubstituted vanadium compounds: new molecules for improve GLUT4 mRNA expression?

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Vanadium compounds have been believed to be ideal drugs for diabetes biological therapy. The aim of this study was to verify the effect of substituted group in the ligand on vanadyl (IV) compounds on the mRNA expression of glucose transporter insulin-sensitive isoform (GLUT4) in cardiac and skeletal muscles, relating the redox properties of the complexes and biological effects. Diabetic animals by alloxan injection (37.5 mg/Kg BW) were divided in 5 groups: Vehicle (CX – diabetic control group), [VO (salen)] (NS – non substituted), [VO (5NO2-salen)] (NO2), [VO (5OH-salen)] (OH) and [VO (5OCH3-salen) (OCH3) compounds using ip injections (12.5 nmol / kg BW) for 21 days. Skeletal muscle Gastrocnemius (GAST) and Heart were removed and total RNA was extracted using Trizol reagent. GLUT4 mRNA was quantified by RT-PCR. A group of non-diabetic animals was used as reference group (R). There was no alteration in body weight among all groups. All alloxan-injected rats with glycemia above 300 mg/dL were considered diabetic animals. After treatment, only NS group presented a 50%-reduction in glycemia (before:454.0±18.3; after 230.0±42.0*, *P<0.05 vs before). In GAST, there was an increase in GLUT4 mRNA content in NS, OH and OCH3 compared to R and CX (R=100.2±8.5 n=6, NS=152.5±19.2* n=6, NO2=112.5±8.2 n=7; OH=188.5±55.2* n=4; OCH3=252.4±19.0* n=3, CX=69.5±13.1 n=5 / *P<0.05 vs. R and CX, results expressed as Arbitrary Units, AU). On the other hand, in Heart, there were a reduction in GLUT4 mRNA expression in NS compared to R, an increase in OH and OCH3 compared to R, NS and CX, and an increase in NO2 compared to CX (R=99.9±5.0 n=5, NS=47.5±17.9* n=5, NO2=119.9±17.1# n=8, OH=158.3±17.3** n=4, OCH3=169.9±20.7** n=4, CX=56.4±10.8 n=4 / *P<0.05 vs. R, ** P<0.05 vs. R, NS and CX, # P<0.05 vs. CX, results expressed as AU). These results showed that: a) the non substituted compound [VO (salen)] has a muscle-specific action; b) the more efficient compounds are [VO (OH-salen)] and [VO (OCH3-salen)] having positive effect on GLUT4 transcription in both muscles; c) the [VO (5NO2-salen)] has a more discrete effect in GLUT4 mRNA expression in both muscles. It is important remind that the more efficient compounds are intermediary in terms of chemical behavior among further used molecules, presenting higher level of hydrophilicity, which can be responsible for positive effect on GLUT4 expression in both muscles. Financial Support: FAPESP 2004/10130-0.

No conflict of interest

P-1170

A study of serum vitamin B12 levels in type 2 diabetic patients on long term metformin monotherapy

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Introduction: Metformin induced impaired vitamin B12 absorption leading to fall in serum cobalamin levels has been described in literature as early as 1971. Approximately 10 % of patients and in some studies 30% of patients on metformin therapy developed metformin related cobalamin deficiency. The risk of cobalamin deficiency is comparatively more among patients with vegetarian diet than in non-vegetarians

Objectives:

Primary: To study the serum vitamin B12 levels in type 2 diabetic patients on long term metformin monotherapy

Secondary: To study the relationship of serum B12 levels to dietary habits.

Materials and methods: By using available database of patients with type 2 diabetes mellitus, lists of all patients with type 2 diabetes mellitus on metformin monotherapy or insulin and metformin were made. These patients will be asked to visit the hospital by contacting them through telephone. A total of 45 patients were chosen. By using a pilot-tested proforma, details were collected on demographic data, dietary habits. Duration of treatment with metformin and dose of metformin was also noted. All patients will undergo routine investigations which include RBS, PPBS, and HbA1C. After taking their informed consent, 5 ml of blood will be collected and sent to the central laboratory for serum vitamin B12 estimation. Vitamin B12 estimation was done using a recently developed method called active vitamin B12 assay. 35 age sex matched non-diabetic controls were also chosen, who also underwent serum B12 estimation.

Results: Our results showed that mean B12 of patients in study group and control group was 50.62 pml (picomoles)/dl and 40.66pml/dl respectively (p value 0.301). The sub group analysis showed that mean B12 levels was significantly lower among vegetarian cases (37.25 pml/dl) and controls (18.08 pml/dl) compared to non vegetarians.

Conclusion: Our study shows that patient's serum B12 deficiency is significantly higher in patients on vegetarian diet and is not related to long term metformin therapy.

No conflict of interest

P-1171

Drug usage by diabetics attending an outpatient clinic

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Aim: To analyse the monthly usage of various drugs by Diabetic patients attending a Diabetes treatment facility in South India.

Methods: The drugs dispensed from our Diabetes centre, situated in a city in South India, was analysed to see the usage of drugs in various categories and to understand the prescription pattern. The drugs dispensed every month was categorized and tabulated for three consecutive months. Number of patients who used the facility was determined. The average monthly usage of each category of drug was noted.

Results: The following were the results obtained. Monthly average number of patients: 600. Monthly usage of various drugs are given below as number of strips (10 tablets).Oral hypoglycemic agents: Sulfonylurea: 85.3 (alone),1365 (combination), 1450.3 (total) Glibenclamide 27.3 (alone), 855 (combination), 882.3 (total),Glipizide200, Gliclazide 32,Glimepiride 58 (alone), 278 (combination), 336 (total). Thiazolidinediones (tzd) 197 (alone), 7.3 (combination), 204.3 (total), Sitagliptin 10.6 (alone), 32 (combination), 42.6 (total), Metformin161.7 (alone),+ sulfonylurea 1365, + sitagliptin 32, + tzd 7.3, 1566 (total), Voglibose 11.3, Antihypertensives: Calcium channel blockers 63 (amlodipine 52, nifedipine 11), Beta blockers 47, Angiotensin receptor blockers (ARB) 275, Aspirin 53, Atorvastatin 98, Insulin:number of vials: human 7, analogue 0, pen refills: human 87, analogue 36, total: Human 94, Analogues 36, Total Insulin (vials+penfills) 130

Discussion: The important groups of drugs used in Diabetic patients include hypoglycemic agents, antihypertensives, statins and aspirin. Amongst the hypoglycemic agents used metformin and sulfonylureas still continue to be the most widely used drugs because of lower cost, greater efficacy and availability. Our observation shows that metformin is the most widely prescribed drug followed by sulfonylureas. Glibenclamide was most widely used sulfonylurea in our practice while as a single agent it was glimepiride which had the highest usage. Use of conventional human insulin (94 vials) is more than analogues (36 vials). Insulin pen refills are more widely used (123 refills) than vials (7). ARBs are the most widely recommended group of antihypertensives in Diabetics. Our practice also shows ARB as the most preferred antihypertensive.

Conclusion: Analysis of monthly drug dispensing from our Diabetes centre in South India shows that the most widely prescribed OHAs were metformin and sulfonylurea and antihypertensive was ARB. Insulin pen refill usage was seen to be more than that of insulin vials. This shows that conventional drugs are more widely used than the newer ones. However insulin pen usage is more in our practice than vials and syringes.

No conflict of interest

P-1172

Markers of endothelial dysfunction in type 2 diabetes mellitus: clinical prospective

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Background: Cardiovascular complications due to diabetes mellitus are most common cause of mortality and tight glycemic control can reduce these complications.

Methods: Ninety poorly glycemic controlled type 2 diabetes mellitus patients with cardiovascular complications were included in this study. Based on antidiabetic drug received patients were divided in three groups and evaluated with respect to glycemic control, lipid profile, serum insulin level, CRP, TNF-α, NOx, VEGF and angiogenin after 16 weeks of antidiabetic drug treatment.
Results: Reduction in serum fasting glucose, post prandial glucose and glycosylated hemoglobin were significant in all groups. PPAR-γ agonists (pioglitazone, rosiglitazone) reduced FBS, PPBS and HbA1C% more than glipizide. HDL cholesterol was increased by PPAR-γ agonist while decreased by glipizide. Increase in serum insulin level and decrease in CRP were significant in all groups. Reduction in TNF-α, NOx and augmentation in VEGF angiogenin levels were significant in all three groups. Decrease in NOx, TNF-α and increase in VEGF were highest in pioglitazone group while angiogenin level was highest in rosiglitazone group.
Conclusion: This study demonstrate that the pioglitazone is more beneficial on the above parameters as it reduces endothelial dysfunction markers while maintaining the glycemic control almost equivalent to rosiglitazone.

No conflict of interest

Physical activity and exercise

P-1173

Cerebral perfusion is affected during incremental aerobic exercise in patients with type 2 diabetes: is it a matter of cardiac output ?

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In healthy subjects, cerebral blood flow increases in response to brain activation associated with dynamic exercise. Cardiac output is an important determinant of cerebral blood flow regulation during exercise. Type 2 diabetes is associated with systemic and hemodynamic abnormalities but it is unknown whether the cerebral blood flow response to dynamic exercise is affected.
Aims: We questioned whether the brain perfusion to aerobic exercise is affected in patients with type 2 diabetes in relation to systemic hemodynamics.
Methods: Eight patients with type 2 diabetes and 7 age-matched male control subjects performed incremental cycling exercise of 30 watts (W) stage^{-1}, and beginning at 60 W, until exhaustion. We measured systemic hemodynamics (arterial pressure, cardiac output), transcranial Doppler-determined mean middle cerebral artery flow velocity (MCA V_{mean}) and arterial pressure for carbon dioxide (P_aCO_2).
Results: With incremental cycling exercise, the arterial pressure response was comparable for both groups (Type 2 diabetes group: from 103±12 to 118±18 vs. Control group: from 104±10 to 112±12 mmHg, from rest to 150 W) but the increase in cardiac output was lower in patients with type 2 diabetes (Type 2 diabetes group: from 6.1±2.3 to 12.9±4.5 vs. Control group: from 5.7±0.9 to 15.3±1.9 L min^{-1}; p<0.05). MCA V_{mean} increased in the control group (Rest: 41±7; 60 W: 45±6; 90 W: 44±6; 120 W: 44±6; 150 W: 43±6 cm sec^{-1}; p<0.01 for 60 W and 90 W vs. rest and p<0.05 for 120 W vs. rest) but decreased in patients with type 2 diabetes (Rest: 41±7; 60 W: 41±8; 90 W: 39±8; 120 W: 38±8; 150 W: 36±8 cm sec^{-1}; p<0.01 for 150 W vs. rest). P_aCO_2 decreased from 90 W to exhaustion in patients with type 2 diabetes (from 5.1±0.4 to 4.2±0.7 kPa; p<0.01) but remained constant in the control group (from 5.1±0.4 to 4.7±0.4 kPa; p=ns).
Discussion/conclusion: As compared to control subjects, patients with type 2 diabetes lack the ability to elevate MCA V_{mean} during dynamic exercise with an attenuated increase in cardiac output. These findings identify a previously unrecognized impaired cerebral hemodynamic response to cycling exercise in patients with type 2 diabetes. We suggest that the attenuated increase in cardiac output in these patients limits the elevation in cerebral perfusion in response to incremental dynamic exercise.

No conflict of interest

P-1174

Change of high molecular weight adiponectin and insulin resistance

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Aims: The reduction of visceral fat (VF) by exercise and diet is an important factor for improving insulin sensitivity, and it can also affect adiponectin secretion. Adiponectin is categorized into 3 types. Recent studies have demonstrated high molecular weight (HMW) adiponectin to more strongly influence insulin resistance (IR) than other types of adiponectin. Although, the HMW adiponectin level could decrease depending on the VF, the magnitude of the changes obtained by exercise intervention or calorie restriction remain unclear. Therefore, the aim of this study is to compare the changes in the HMW adiponectin levels and IR on exercise intervention and calorie restriction.
Methods: Thirty five subjects (men: 17 and women: 18, age: 57±9 years, weight: 76.15±13.36 kg) who all had at least one of the metabolic syndrome risk factors were recruited for this study. The subjects were randomly assigned to the exercise (Ex; n=11), diet (D; n=11), and the Combination of exercise and diet (C; n=13) groups. They participated in each program for 12 weeks. The exercise group participated in aerobic exercise training at the lactate threshold intensity (LT). The exercise volume was assigned to be 300 min/week. The subjects in the exercise group were ordered to not to change their normal life style except for exercise. The diet group controlled their food intake according to the advice of a dietician every week. The target calorie was 25 kcal/kg of ideal body weight (BMI=22). The subjects were ordered not to change their normal amount of physical activity. Blood samples were collected after 12 hours of fasting. The HMW adiponectin, glucose, and insulin levels were all determined by blood samples. IR was evaluated by HOMA-IR. The VF was measured by computed tomography.
Result: VF (Ex: -27.58±22.53 cm^2, p<0.01; D: -55.81±25.29 cm^2, p<0.01; C: -47.71±47.34 cm^2, p<0.01) and body weight (Ex: -3.43±2.09 kg, p<0.01; D: -7.85±4.26 kg, p<0.01; C: -6.50±3.50 kg, p<0.01)significantly decreased in all groups. The HMW adiponectin level increased in the D group (0.56±0.69 μg/ml, p<0.05), while in the Ex group it significantly decreased (-0.09±0.94 μg/ml, p<0.05). On the other hand, the C group showed no significant difference with baseline. HOMA-IR significantly decreased in D (-1.01±1.62, p<0.05) and C (-1.09±1.58, p<0.05) groups, but not in Ex.
Discussion and conclusion: Calorie restriction was observed to decrease IR, which may be induced by an increase in the HMW adiponectin levels. Although LT exercise training was seen to decrease the HMW adiponectin levels, IR was not affected. This study demonstrated that the exercise and diet may each induce different factors which can improve IR.

No conflict of interest

P-1175

Changes in clinical and metabolic parameters in patients with Type 2 diabetes mellitus after exercise therapy

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Objective: The study investigate the effect of Hatha yoga and conventional physical training (PT) exercise intervention on clinical and biochemical parameters in patients with Type 2 diabetes mellitus.
Method: The patient population consisted of 77 Type 2 diabetic patients in the Hatha yoga group that was matched with the same number of patients in the conventional PT and control groups. The clinical parameters were weekly diastolic and systolic blood pressure, along with body mass index (BMI). Biochemical parameters include weekly blood glucose, serum creatinine, microalbuminuria and glycated hemoglobin (HbA1c) measured at baseline and two consecutive three-monthly intervals.

Results: There were significant differences in the blood glucose concentration "before exercise" and "after exercise" for the Hatha yoga and conventional PT exercise groups at differents weekly intervals ($p<0.05$). The frequency of signs and symptoms of hypo- and hyper-glycemia over the weeks during exercise was greater in the conventional PT exercise group than in the Hatha yoga exercise group ($p=0.004$). The HbA1c concentration decreased after six months in the Hatha yoga and conventional PT groups and was significantly different from that of the control group ($p<0.05$). There were significant reductions in systolic and diastolic blood pressure readingss observed before and after exercise for the Hatha yoga and conventional PT exercise groups ($p=0.0001$).
Conclusion: These observations suggest that short lifestyle modification using Hatha yoga exercise leads to favourable clinical and biochemical outcomes in patients with Type 2 diabetes mellitus.

No conflict of interest

P-1176

Waist to hip mediates inverse association of walking with A1C but not of walking with blood pressure among women with type 2 diabetes

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Aims: Among men and women with type 2 diabetes, to assess the associations between walking and the cardiovascular risk indicators, A1C, blood pressure, and dyslipidemia; and to determine whether these associations persist after accounting for anthropometrics.
Methods: 200 adults with type 2 diabetes were recruited from outpatient clinics. Variables measured included daily steps (Yamax SW-200 pedometers), anthropometrics (body mass index; waist circumference; waist-to-hip ratio), A1C (Biorad II HPLC) and blood pressure. The use of any dyslipidemia therapy was the proxy for dyslipidemia. Age and race adjusted estimates were computed (linear/logistic regression) for the associations of (i) daily steps with A1C, blood pressure and the odds of dyslipidemia (with and without adjustment for anthropometrics); and (ii) daily steps with anthropometrics.
Results: Daily steps were inversely associated with A1C and the odds of dyslipidemia among women (Table 1). Adjustment for anthropometrics resulted in a loss of statistical significance among women, but had little or no effect on these associations among men. Daily steps were inversely associated with both systolic and diastolic blood pressure among women and with diastolic blood pressure among men (Table 1). Adjustment for anthropometrics decreased the magnitude of the association among women but it remained statistically significant. Adjusting for anthropometrics had no impact on the association between steps and diastolic blood pressure in men.
Conclusion: We detected significant inverse associations in women of daily steps with A1C, dyslipidemia, and blood pressure. It is possible that the inverse associations with A1C and dyslipidemia are mediated by abdominal obesity given the loss of statistical significance with the introduction of WHR in our models. In men, we detected a significant inverse association between daily steps and diastolic blood pressure.

Table 1: Age and race adjusted change in cardiovascular risk indicators per 1000 daily step increment

	Women	Men
A1C, %	-0.13 (-0.25, -0.01)	-0.10 (-0.22, 0.02)
Dyslipidemia* (odds ratio)	0.80 (0.63, 1.00)	1.08 (0.87, 1.33)
Systolic BP	-2.86 (-4.32, -1.40)	-0.82 (-2.22, 0.59)
Diastolic BP	-1.66 (-2.49, -0.82)	-0.77 (-1.55, 0.00)

No conflict of interest

P-1177

Effects of exercise training at anaerobic threshold intensity on glycemic control in type 2 diabetic women

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Exercise associated to diet and medication composed the type 2 Diabetes Mellitus (DM2) treatment. Although the anaerobic threshold (AT) is more sensitive for exercise intensity prescription, in general, maximum heart rate and oxygen consumption (HR_{max} and VO_{2max}) are used for this purpose. Therefore, the aim of this study was to assess the effects of exercise training at AT intensity on glycemic control in DM2 women.
Methods: Twenty four sedentary DM2 started in this study and nineteen (79%) were able to conclude it. These nineteen DM2 were separated in two groups: control group (C) (n=10; C: 55.9±2.2 years; 72±4kg; 37.3±1.9% fat; 155±2 cm of height; 3.7±0.9 years of diagnosis) which to keep sedentary during the study, and trained group (T) (n=9; 53.4±2.3 years; 75±6 kg; 39.5±2.4% fat; 152±2cm of height; 4.4 ±1.1 years of diagnosis) which to participate in exercise training: twelve weeks of walking at AT intensity (4.7±0.3km/h; 85±4% VO_{2max}; 82±3%HR_{max}), three times/week, 20-60 min of exercise session duration. Exercise tests were conducted on a previously calibrated treadmill (Moviment—LX-160), with initial velocity of 1 km/h and increments of 1 km/h every 2 min, without any inclination, and until voluntary exhaustion. AT were assessed by two independent investigators through the visual inspection of ventilatory parameters curves (VO2000 Gas Analyzer, Med Graphics). VE/VO_2 increases without a concomitant rises in VE/VCO_2 was used as the main criteria to identify AT. Glycemic control was evaluated by glycated haemoglobin (HbA1c) (HPLC-BioRad DiaSTAT Analyzer) and fasting blood glucose (FBG) (colorimetric enzymatic methods - Laborlab ® kits) before and after training period. Furthermore, each two weeks was measured blood glucose (Optimum-Medisense Product, Abbott Lab ®) pre and post exercise bouts. All data were expressed by mean ± SEM and ANOVA two way was used for comparisons (statistical significance $p<0.05$).
Results: Group T was 86-100% of attendance in exercise sessions. There was significant decrease in HbA1c values in group T after exercise training period and it was not observed in group C (6,8±0,4 vs 5,9±0,2%; 7,2±0,5 vs 7,2±0,7%, respectively). FBG did not change in either group T or group C after exercise training period (120±9 vs 110±8 mg/dL; 132±16 vs 142.8±20.3 mg/dL respectively). However, in every measured week, blood glucose was significantly different pre vs post exercise bouts (162.2±8,5 vs 118.5±7.1 mg/dL).
Discussion/conclusion: Exercise training at AT intensity promoted decrease in blood glucose post exercise bouts as HbA1c. It represents acute and chronic improvement in glycemic control, which it is very important to decrease DM2 complications due the hyperglycemia. Therefore, we point out the relevance of AT use for the exercise intensity prescription in DM 2 population.

No conflict of interest

P-1178

Physical activity, a key part of diabetes education

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The purpose of the present study was to demonstrate the contribution of physical activity to glycemic control in diabetes mellitus patients enrolled in a workshop with multidisciplinary health care professionals.
Methods: We have analyzed, from August to December of 2006, 137 people enrolled in a physical activity workshop, which is part of a Diabetes Education Program. Patients who arrive at the "Associação de Diabetes Juvenil - ADJ" at

7:45am, are fasting since midnight. After measuring their blood glucose for the first time (gluc0), using a regular glucometer, they receive insulin and/or medication, as prescribed. During the day, patients' blood glucose is assessed two times every 2 hours: before a snack (gluc1) and before lunch (gluc2); and three hours after lunch: before (gluc3) and after (gluc4) physical activity. Physical activity consists of 5' of warm up, 20' of walking, and 5' of cool down for adults; and 5'of warm up, 10' of playing games, 10' of very light and fun activity, and 5' of cool down for children. The day ends at 5:00pm. Patients were divided into 3 groups as their own treatment: oral agent (OA), insulin (Ins), and OA plus Ins. Analysis of variance was used to asses the significant difference among groups. The significance level adopted was p<0.05.

	Treatment					
	oral agent n=59		oral agent plus insulin n=26		insulin n=52	
	mean	SD	mean	SD	mean	SD
age y	60	9	61	11	42	21
diagnostic y	6,6	5,4	12,4	5,4	10,3	9,2
gluc0 mg/dL	157,3	61,3	174,0	55,6	170,8	65,1
gluc1 mg/dL	#195,1	67,2	215,3	53,6	#221,5	57,6
gluc2 mg/dL	#148,8	66,5	159,5	53,6	#171,4	52,9
gluc3 mg/dL	187,7	71,8	197,8	57,1	200,3	64,7
gluc4 mg/dL	150,7	68,2	143,3	61,9	144,3	63,4

#Differences between groups OA and Ins (p<0,05).

There were differences in all paired test in all groups for (gluc0 to gluc1; gluc1 to gluc2; gluc2 to gluc3; gluc3 to gluc4; p<0,05). Post physical activity glycemic level of all groups was lower than the pre activity levels. The Insulin group had a greater glucose decrease than OA group (56±5,6mg/dL; 37± 4,4mg/dL; p<0,05; mean±SE).

Discussion: Glucose level was high in all groups. After physical activity the decrease of patients' glycemia from all groups was so noticeable that the levels returned to fasting state level in OA group, and below fasting state values in Insulin and OA plus Insulin groups.

Conclusion: Even though the target glucose level was not achieved, physical activity promoted a prominent reduction in glucose levels. This work reinforces the importance of: physical activity as one of the effective ways to control glucose levels in diabetes mellitus; and an interdisciplinary approach of health care professionals, including physical educators.

No conflict of interest

P-1179

"Welhabit" Diabetes self-monitoring program using information technology

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Background: Healthcare assistance for persons with diabetes includes self-monitoring blood glucose, weight scales, sphygmomanometer, and pedometers. Having such patients monitor their health by self-administered urine glucose monitors has proven effective in controlling the disease. Self-monitoring also benefits health-care professionals receiving patient data via the Internet.

Objectives: The "Welhabit" diabetes self-monitoring program we developed collaboratively with a company consists of a hand-held equipment with a pedometer function. We studied its feasibility in conjunction with 12 outpatients.

Methods: Our clinic is specialized clinic in diabetes located in Tokyo. We treat approximately 900 outpatients per month, of whom 79% are diabetes, and 48% have hypertension. Subjects were 12 persons with diabetes. Subjects attached the hand-held equipment to a belt or other convenient site to automatically record daily exercise and other data, and then input data on meals, medications, blood glucose levels, and urine glucose levels measured by other urine glucose meters. They sent data each night to the hospital via the Internet and automatically received medical analysis results and advice from the host computer. Advice included comments on subjects' amount of exercise and energy, salt, and alcohol intake. All data was graphed and sent regularly to health-care professionals for reference.

Results: Self-administered questionnaires showed that subjects' exercise habits significantly improved by 92% and diet by 83%. Blood tests showed that their glycoalbumin decreased from 22.3 ±2.2% at baseline (mean ±S.E) to 19.0 ±2.9% three months after starting self-monitoring using our program. Total cholesterol decreased from an average of 222 ±8.9 mg/dl to 207 ±4.4 mg/dl. An unexpected result, however, was that 25% of subjects felt "overly supervised".

Conclusions: Despite the 25% of subjects feel "over-supervision," the transmission of diabetic lifestyle information to health-care professions each day and the quick advice that subjects received proved mutually beneficial and an overall lifestyle improvement for diabetic patients.

No conflict of interest

P-1180

The effects of home-based brisk walking exercise on blood glucose, blood pressure and microalbuminuria in type 2 diabetic patients with microalbuminuria

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The purpose of this study was to examine the effects of home-based brisk walking exercise on blood glucose, blood pressure and microalbuminuria in type 2 diabetic patients with microalbuminuria. A two-group pre-post test quasi-experimental research design was used. Sixty-one diabetics with microalbuminuria were selected from an outpatient department at regional hospital in Northern Taiwan. These patients, by their own choice were assigned to the experimental group (n=30) and the control group (n=31). Patients in experimental group received a 12-week home-based brisk walking program and routine health education, while patients in the control group received routine health education only. Research instruments were pedometer and electronic sphygmomanometer. The independent variable was the home-based brisk walking and the dependent variable were blood glucose, blood pressure and microalbuminuria. All data were analyzed by SPSS/Windows 15.0 statistical package software, included percentage, mean, standard deviation, minimum, maximun, chi-square, independent t-test, paired-t test, pearson correlation. Results of the data in the experimental group showed a markable decrease in fasting glucose (t = 2.164, p = .039), systolic blood pressure (t = 2.957, p = .006) and microalbuminuria (t = 2.324, p = .027), while data in the control group indicated no significant change in the above three variables. In the treatment group, decrease of microalbuminuria in the higher heart rate walking subgroup was greater significantly than those of the low heart rate walking subgroup (t = 2.128, p = .046). Walking steps correlated significantly with the lowering value of fasting glucose (r= .204, p = .012). While clinical nursing staff can use information generated from the study as one of educational resources for diabetes patients with micralbuminuria.

No conflict of interest

P-1181

Reduction of blood glucose and excitability levels of physical exercise for people with Type 2 diabetes

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Introduction: Diabetes Mellitus (DM) is a metabolic chronic-degenerative disorder that is associated with failure and/or inefficient action of insulin, characterized by elevated glucose in the blood. Currently, physical activity is an important factor for the treatment of diabetes mellitus type 2 to improve control of blood glucose and provide a better quality of life for people with diabetes. It is known that more vigorous physical activity can induce significant fluctuations in blood glucose, according to excitability levels (EL) involved in physical activity induced.

Objective: the aim of this study is analyze the glycemic reductions of a physical exercise program due to different levels of excitability.

Methods: This study was composed by twelve subjects with type 2 diabetes, aged between 40 and 60 years, both sexes, participants of Doce Desafio Institute / Proafidi. The program of physical exercise consisted of 16 weeks of training with sessions of resistance and cardiovascular exercises. The magnitude of glucose reduction was analyzed by the difference between capillary glycemia

(CG) CG = pre-exercise - CG post-exercise. EL were classified according to intensity, ie, EL1 = low; EL2 = medium, EL3 = high. The descriptive analysis was performed using the mean ± standard deviation, and inferential analysis performed by the Student t test, with significance level set at p = 0.05, that (*) when compared with EL 3 and (+) when compared with EL2.

Results:

Excitability Levels	CG Reductions
1	24,89 ± 13,24 *
2	17,06 ± 9,33 *
3	5,67 ± 3,06 +

Conclusion: It seems that the higher levels of excitability of the sessions of physical exercise, lower acute glycemic reductions. It should be noted that these requirements are not contra-indicated or ineffective, since the analysis was acute and it can not be said that the responses to chronic glycemia are bad.

No conflict of interest

P-1182

Physical activity, as an effective remedy for achievement of psychosocial rehabilitation and normoglycemia in children and adolescents

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Background and aims: Rehabilitation centre set up in 2008 on the base of Georgian Diabetic Children's Protection Association, serves diabetic children and adolescents 0-18 and 18-25 years of age. Rehabilitation centre is equipped with modern fitness and sport halls, where skillful professionals are employed.
Materials and methods: Diabetic children and adolescents started physical activity after theoretical training in the summer of 2008. The following control groups have been studied: Group 1: girls 13-18; Group 2: girls 18-25; Group 3: boys 13-18. HbA1c levels measured prior to rehabilitation exercise were: Gr. 1 - 9.13%, Gr.2 – 8.58% and Gr. 3 - 7.9%.
Results: Nine months of observation demonstrated, that HbA1c level decreased in 40% of patients in Gr.1 who regularly measured glycemia before and after exercise in average to 7.8%, and in patients who measured not regularly this parameter increased in average to 9.49%. The same was shown in girls 18-25 years of age, namely in 40% decreased from 8.48% to 7.6%, and among the rest of children this index increased to 9.2% and 8.0% respectively. Among the patients who improved HbA1c level, body weight was reduced by 3-5 kg, and insulin daily dose – by 12-18%.
Conclusion: Daily physical activity produces positive result only when combined with blood glucose regular control. Recommendation to the parents of diabetic patients: when blood glucose is >10-11 mmol/l, physical activity should be avoided.

No conflict of interest

P-1183

Effect of antidiabetic medication on acute post-exercise glucose response among subjects with type 2 diabetes

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Introduction: Physical activity is part of the treatment of Type 2 Diabetes Mellitus (DM2) and the use of oral antidiabetic medication is very common among these individuals. Thus, a comprehensive knowledge of the action of these drugs on the glucose variation during physical exercise is necessary for a proper control of the subjects.
Aim: The aim of this study is to evaluate the acute post-exercise glucose response and its relation with the regular use of metformin, sulphonylureas or both among DM2 individuals. This might add to the precautions taken by physical education instructors and DM2 subjects when adjusting pre-exercise glucose values.
Methods: Sample of 29 sedentary subjects, aged 47 to 75 years, with DM2 who were not insulin-treated and took part in a diabetes and exercise education program. When they entered the study, 13 (47%) were using metformin (MET), 8 (27%) sulphonylureas (SUL) and 8 (27%) both (M+S). Glucose values were collected before (GB) and after (GA) the exercise sessions, using a glucometer, in 3 nonconsecutive days, not more than five days apart. The exercise sessions of 50 minutes included a warm-up, aerobic and resistance exercise and stretching. Analysis of variance (ANOVA) and Wilcoxon tests were used for statistical analysis.
Results: Regardless of the type of medication, the initial glucose mean value decreased significantly after the exercise sessions (GB=164, SD=52 and GA=115, SD=35), p=0,05. MET subjects (mean age=63) had GB=160 + SD= 50 and GA=108 + SD=36mg/dl. SUL individuals (mean age=57), had GB=161 + SD= 51 and GA=104 + SD= 33mg/dl. M+S subjects (mean age=57), GB=175 + SD 53 and GA=134 + SD=26mg/dl. M+S subjects had higher mean value of GB and GA but a smaller blood glucose decrease. This might be due to the fact that subjects using combined antidiabetic medications are normally having more difficulty in controlling glucose levels and might also use lower drug doses.
Conclusion: There was no statistical difference in the glucose behavior between the three groups. M+S group showed a trend to higher values of blood glucose before exercise and lower reduction after the sessions. SUL group showed a trend to a higher decrease of glucose values. In this sample, there was no glucose variation difference among individuals under different drug therapies.

No conflict of interest

P-1184

A comparative study of physical activity and anthropometric changes in diabetic and non diabetic groups in the same socio-cultural backgrounds

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Aims of the study:

1. To compare the physical activity and habits among diabetic and non diabetic people in the same ethnic and socio cultural backgrounds.
2. To compare the anthropometric measurements in diabetic and non diabetic people in the same socio cultural backgrounds.

Materials and methods: This was a case control study.153 subjects having diabetes of varying duration on treatment were compared with 153 non diabetics matched for age, gender, cultural and religious backgrounds. Those having familial hyperlipidemias, hypothyroidism and those on glitazones, lipid lowering drugs were not included. Detailed history, social habits, and anthropometry were done in both the groups.
Observations: The age group ranged between 26 to 85 years with mean age of 53.93 ±10.66. There were 86 (56.2%) males and 67 (43.8%) females among both the groups. The groups were comparable in religious background, smoking and alcoholism. Hours of physical activity and Television viewing were compared in both the groups. Among the controls, 76 (49.67%) were physically inactive and 77 (50.33%) active and from subjects, 121 (79.08%) were inactive and 32 (20.92%) active (p = 0.00). Among the controls 47 (30.72%) did not watch TV at all and 106 (69.28%) used to watch TV for some hours of the day. Among diabetics 21 (13.73%) did not watch TV at all and 132 (86.27%) used to watch TV for some hours of the day (p = 0.00).Mean BMI was 25.18±3.89 in the diabetics and 24.12 ±3.20 in the controls (p = 0.009). Among Diabetics, mean BMI of males was 24.46±3.24 and of females was 26.11±4.45 (p = 0.009).In females, mean BMI was 24.34±3.62 for controls and 26.11±4.45 for diabetics (p=0.013). Among diabetic patients mean waist circumference of males was 89.71±7.88 and of females was 95.1±9.48 (p = 0.000) and among controls mean waist circumference of males was 87.41±7.87 and of females was 88.14±9.84 (p = 0.61). Among females mean waist circumference was 88.15±9.84 for controls and 95.11±9.48 for diabetics (p=0.000).
Conclusions: Physical inactivity and hours of Television viewing were higher in the diabetic group compared to non diabetic group. Mean BMI was higher in the diabetic group. Mean BMI and waist circumference was higher in females in the diabetic group compared to males. Moreover females in the diabetic group had higher BMI and waist circumference compared to the females in the non diabetic group.

No conflict of interest

P-1185

Acute post-exercise glycemic variation in people with type 2 diabetes and its relation with initial value

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Aims: The aim of this study is to evaluate glycemic variation after physical exercise in noninsulin-dependent people with type 2 diabetes under different levels of blood glucose measured before exercise.
Methods: Sample size:28 noninsulin-dependent type 2 diabetic people, participating in a physical exercise program for people with diabetes, 15 men and 13 women, ages: 57±9 years, duration of diabetes: 6±7 years. Data was collected using questionnaire, glycemic levels measures by glucose monitors before and after exercise bouts. Selected 5 first exercise sessions of each subject, excluding those with glycemia <100mg/dL or >250mg/dL. Exercises prescribed: resistance training, flexibility training, walk, games. Categorized data according to initial glycemias: Level A - 100 to 139mg/dL; Level B - 140 to 199mg/dL; Level C - 200 to 250mg/dL. Variables analyzed: Initial glycemias and glycemic variations. Statistical analysis calculated by Pearson's Correlation Coefficient, p.
Results: Glycemic variation under different levels presented the following reductions: Level A = 12±20mg/dL (9%), Level B = 38±36mg/dL (22%) and Level C = 88±43 mg/dL (40%). It is observed a fall in Pearson's Correlation Coefficient related to the increasing of intial glycemia, being p=0,464 in Level A, p=0,3 in Level B, and p=0,085 in Level C. There was a moderate correlation between both variables, p=0,69.
Discussion: The glucose absorption depends on a lot of factors. Three of them are more relevant: intracellular metabolic process, glucose transporters (GLUT) translocation mechanism to the cell membrane and availability of glucose for the muscle cells. During exercise, the muscle tissue presents higher energetic demand, requiring higher expenditure of energetic substrate, usually, glucose. We can also observe a rise in concentration of glucose transporter in the cell membrane, facilitating the glucose absorption. The last factor was observed in this study. The hypoglycemic effect of exercise is more intense as higher is the availability of glucose for the muscle cells or the glycemic level at the beginning of the exercise.
Conclusion: We concluded that, based on this sample, the post-exercise glycemic variation is higher in cases where you observe higher glycemic level before exercise. We can also note that the glycemic responses to the exercise are less homogeneous the higher are the initial glycemic levels. We can not precisely predict the hypoglycemic effect of exercise, as shown how variable these effect is. What we can expect is a higher variation of glycemia as higher are its initial levels.

No conflict of interest

P-1186

Glycemic variation post-exercise: comparison between people with type 2 diabetes insulindependent and noninsulindependent

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Aims: The aim of this study is to compare the glycemic variation post-exercise between people with type 2 diabetes who are treated with or without insulin.
Methods: Sample size of 12 type2 diabetic subjects participating in a group of oriented physical exercise (8 men, 4 women, age 56±8 years; 9±8years of diagnosis). 6 of them were treated with insulin (3 men, age 58±8 years, 15±8 years of diagnosis) and 6 of them were treated with other different therapies (5 men, age 54±7years; 4±3years of diagnosis). Data was collected through questionnaires and glycemias were measured with portable blood glucose meter. In 5 different days, all the 12 subjects participated in the same activities. The exercise protocol consisted in 5 min of warm up, 6 resistive exercises for the major muscle groups with 2 set of 15 reps each.
Results: Before the beginning of the exercise bout, the mean glycemia was in the insulintreated group 228mg/dL and 120mg/dL in the group not on insulin. After the exercise, the two groups had different lowering effects on the glycemia. In the insulintreated group, there was a reduction of 31% (mean) of the level, reaching 158mg/dL. In the group not on insulin, the lowering effect was less expressive, 17%, but in absolute values, it was lower than the otrher group, 99mg/dL.
Conclusion: In this study, the insulintreated group presented higher glycemic levels before and after exercise and also a higher glycemic variation comparing to the group that was not treated with insulin.

No conflict of interest

P-1187

Relationship between physical activity and fasting glycemia

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Diabetes mellitus has a high prevalence in proportion to Brazilian population in the world population, making necessary greater attention and education on the matter. On the world day of diabetes, in the city of Uberaba, is performed, there are 8 years activity physical-recreational and educational with the participation of diabetics and family. The objective was to evaluate the benefits of physical exercises in these individuals activity.
Methods: This was questionnaire, measured in capillary fasting glycemia and post-prandial, during the implementation of the activity. Data were analyzed by SPSS 14.0 program and through the chi-square with a significance level of 5%
Results: Among the 126 participants from gymkhana, 10 did not reply to the questionnaire, totaling then 116 individuals analyzed. 34.74% of these had taken of 3 or more years of activity. There was 28.6% prevalence of diabetes among these individuals. The majority 78.4% (91/116) performed physical activity regularly and 21.6% did not achieve. Among 91 individuals, 28.6% performed 3 times/week, 17.6% 2 times/week, 13.2% once/week and the remaining 4 or more times a week. The majority (85%) performed 30 to 60 minutes of exercise. There was no relationship between diabetes mellitus and physical activity, since 77.14% of diabetics and 80% of the non diabetics the performed (X^2=0.120, p=0.729). Was no relationship between fasting glycemia and physical activity, where 51.4% were atividdae remained physical fasting glycemia < 100 mg/dl, versus 23.1% of those not performed (X^2=9.837, p=0.007). There was no relationship between glycemia post-prandial and physical activity (X^2=2.741, p=0.98).
Discussion/conclusion: There was a high prevalence of the implementation of regular physical activity among individuals analyzed. Although there is no relationship between the glycemia post-prandial and physical activity, the relationship with fasting glycemia shows the importance of implementation of this type of activity. We must raise awareness and encourage even more the population through guidelines clinical and/or campaigns on the matter.

No conflict of interest

P-1188

Sustained monitoring and support critical to improving exercise behaviour in type 2 diabetes

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Aims: We sought to assess exercise-related barriers and facilitators among overweight adults with type 2 diabetes (T2D) who had previously participated in a supervised exercise program.
Methods: Individuals invited to participate in the present study had previously participated in a program of supervised exercise through our previous trial. The supervised exercise program had been delivered through an established cardiac rehabilitation centre and was supervised by experienced exercise physiologists. The program had been 24 weeks in duration with three group sessions per week for eight weeks, then two sessions per week for the next eight weeks, and finally one session per week for the final eight weeks. Exercises included treadmill, cycling, and cross trainers, and participants wore a heart monitor. In the present study, focus groups were conducted approximately one and a half years following the exercise program. Focus group discussions addressed factors that could facilitate attendance, current engagement in exercise, reasons for continuing or discontinuing regular exercise, and ways to integrate exercise into daily life. Sessions were led by a trained moderator; audiotapes were transcribed verbatim; transcripts were coded and themes were identified. Themes that recurred across all three focus groups were considered to have achieved saturation.
Results: Fifty-six percent (18/32) of those invited participated in a focus group. Reasons for not participating included physical ailments (three), lack of time

(four), lack of interest (one), or was not specified (six). Barriers to exercise included lack of motivation, physical ailments (e.g. arthritic pain, respiratory tract infection), and travel time to an exercise centre. The support and supervision of the staff facilitated attendance during the program and absence of such supervision was a barrier to exercise following the program. Visible health outcomes such as reduced need for medications motivated exercise behaviour. Following the gym-based program, walking appeared to be the major form of exercise adopted by participants because of ease of integration into daily activities.
Discussion: Adults with T2D require long term monitoring and support for physical activity and exercise. Compared to gym-based exercise, walking may be more feasibly integrated into daily living.

No conflict of interest

P-1189

Correlations between flexibility indexes and previous level of glycemic control and exercise lifestyle in diabetic people with long-term diagnosed diabetes

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Introduction: Lifestyle interventions have broad benefits on diabetes management and can help individuals to control glycemic levels which are an indicator of life quality. A direct relation between flexibility and quality of life in diabetics may be considered. The aim of this study was to verify if this relation exists, also considering the past exercise lifestyle and time of diabetes of the participants.
Methods: Sample: 8 diabetic people who attend Sweet Challenge program (Diabetes Education through an Oriented Program of Physical Activities to Diabetic People), both types 1 and 2, ages 25-64 (43±13) years old, diagnosed for at least 20 (29±7) years, from both sexes. An interview collected the data about past lifestyle. Flexibility measures were taken by goniometry (flexion and abduction of shoulders; flexion and extension of wrist, hip and plantar flexion, dorsiflexion and prayer maneuver). The diabetics were then classified into categories related to each test.
Results: It was found a positive correlation on flexion and abduction of non-dominant shoulder when comparing the level of past physical activity and flexibility. An inverse correlation was found on dominant wrist flexion. A positive correlation was found for dominant dorsiflexion and non-dominant wrist flexion comparing the diagnosis time and flexibility values. An inverse correlation was found on dominant and non-dominant plantar flexion, and also non-dominant hip flexion.
Conclusion: From the data analysis, we conclude that the time of diagnosis can influence joint flexibility, mostly on body extremities. Nevertheless, there is a need to understand better the correlations between these variables. We can also infer that the past active lifestyle can interfere on a frame of weak flexibility.

No conflict of interest

EDUCATION

Diabetes education delivery

P-1190

Evaluating the effect of continuous medical education: an application of the SDM workshop program in Korea

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Background: To increase the diagnosis of unveiled diabetes patients and provide adequate management, Korean Diabetes Association (KDA) has been running the SDM (Staged Diabetes Management) workshop, mainly focused on the primary healthcare professionals, since 2000.
Objective: Analyzing the demographic features and satisfaction about the SDM workshop is the main objective of this study.
Method: The number of the attendances of the SDM, continuity in attendance, and satisfaction about education are applied to figure out the effect of the SDM in Korea.
Result: As a result of analyzing the diagnostic rate of diabetes, primary clinics account for 49.1% [1] of all healthcare institutes. 4,031 healthcare professionals of 2,880 healthcare institutes attended the SDM [2]. Primary clinics took up 2,408 (83.6%) institutes and hospitals (13.9%) and public healthcare centers (2.5%) were relatively occupied small portion[2]. In the aspect of specialty of medical doctors, internists and family physicians took up most as 54.2% and 14.9% among 2,315 doctors[2]. A number of attendance who participated twice or more during 8 years were 387 (9.6%) of all participants[2]. Satisfaction measurement about the programs by participants increased by 12.5% after attending the SDM workshop compared against expectation before workshop[3]. For contents of lecture and clinical usefulness, 65.8% of responders preferred the practice session about the stepwise use of insulin and oral anti-diabetic agents, and self test of blood glucose and injection[3].
Conclusion: For the past 10 years, the SDM workshop has contributed significantly to the diagnosis and management of diabetes in Korea. Not only the increased awareness of diabetes among healthcare professionals and patients, but also the increased number of various healthcare professionals like general physicians, nurses, and nutritionists who have capabilities to care for diabetic patients in primary care is an important achievement of the SDM workshop. Although the SDM has proven to be very effective in increasing the awareness of diabetes and promoting the application of updated knowledge of diabetes in healthcare professionals, there are some limitations. Therefore, we are planning more sophisticated study including the comparison between the patients cared by the healthcare professionals who attended the SDM workshop and who did not in the aspect of the quality of care using HbA_{1c}, the occurrence rate of complications, and cost of management.

1. Ministry for Health, Welfare and Family Affairs, Korean National Health & Nutrition Examination Survey 2001
2. Korean Diabetes Association, List of attendance on SDM workshop in Korea 2000~2007
3. Korean Diabetes Association, Report of satisfaction measurement on SDM workshop in Korea 2007~2008

No conflict of interest

P-1191

Effects of an intensive foot self-care education in the prevention of foot problems in adult patients with diabetes

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Aims: Patients with diabetes are at risk for developing foot problems, which can contribute to significant physical, emotional, and financial losses. Instructing patients about foot-care is necessary to prevent foot complications. The study aimed to evaluate the effects of an intensive foot self-care education intervention in preventing foot problems in adult Chinese patients with diabetes.
Methods: A randomized controlled trial was used in the study. A total of 220 eligible patients with diabetes were randomly assigned to the intensive foot self-care educational group (experimental group: enrollment 110, drop out 24, completion 86) and to usual educational group (comparison group: enrollment 110, drop out 18, completion 92). The sample consisted of 178 adult patients with diabetes, average age was 61.6±11.9 years old, average duration of diabetes was 7.9±6.2 years. The patients in the usual educational group received the routine diabetic treatment and general diabetes education (4-5 hrs). The patients in experimental group received individual intensive education on foot self-care (6-7.5 hrs), given by the diabetes nurse educator in outpatient department on repeated occasions, in addition to usual diabetes education (4-5 hrs). In terms of participants' baseline data on demographic characteristics (i.e., age, sex, education, employment) and diabetes characteristics (i.e., type of diabetes, duration of diabetes, presence of complications, the type of treatment), there were no significant differences between the experimental group and the comparison group (all $P > 0.05$). The effects were evaluated before education and nine months after education.
Results: The results indicated improvement in patients' recognition of signs of foot problems, increased knowledge and skills of daily foot self-care strategies, selecting suitable shoes and socks, and cutting toenails were significantly improved in the experimental group after education ($P<0.05$). Foot problems

such as dry and cracked skin, callus, fungal infection, and foot lesions were reduced significantly nine months after education in the experimental group (P<0.05-P<0.001). FBG, 2h PBG, HbA1c, BMI and blood pressure were controlled much better in experimental group, compared with the comparison group, the differences were significantly found in the study (P<0.05).

Conclusions: The intensive foot self-care educational intervention was effective in enhancing patients' foot self-care skills and in preventing foot problems. This intervention should be incorporated as an additional component in intensive and comprehensive educational program to assist patients' diabetes self-management.

No conflict of interest

P-1192

Breaking down the barriers to diabetes education: audience-specific multiplatform diabetes education

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With type 2 diabetes accounting for approximately 85% to 90% of all diagnosed diabetes cases, it is essential that effective strategies to decrease the incidence of type 2 diabetes be developed. By 2025, worldwide incidence of diabetes is projected to affect over 300 million individuals with a prevalence of over 6% of the world population.

Diabetes education has been identified as an integral part of diabetes care by providing a cost-effective means through which prevention, treatment and quality of diabetes care can be communicated. Disseminating these strategies represents a potential barrier to their implementation, and thus the effectiveness of these strategies.

Metrix Group has demonstrated success in disease education through the creation of a community of learning framework. This structure provides the foundation for generating materials for specific audiences that include perspectives from patients (both adult and children) and physicians. Metrix Group is well-versed in diabetes and metabolic syndrome and has produced multiple educational materials and curricula in these therapeutic areas.

We have enhanced our approach to disease education through the development of paper-based training materials, classroom-based learning, eLearning delivery methods and a combination of the above. In doing so, we have created tools that appeal to various learning styles, which can be disseminated to different target audiences ranging from healthcare professionals to patients and caregivers.

Based on Metrix Group's track record and extensive experience in developing diabetes-related education materials, we have the infrastructure, experience and capability to develop multiplatform, audience-specific educational packages focusing on the prevention and management of diabetes.

In this presentation, you will learn how the Metrix Group approach to the delivery of disease education can break down the barriers of information access. Our approach allows for the delivery of educational materials in a focused, clear and efficient manner. These education materials, and the mode of their delivery, can be customized specifically towards key target audiences for diabetes education, such as children, adults, community-based organizations and healthcare providers.

No conflict of interest

P-1193

The InSight programme - an audit of structured education delivery for people with type 1 diabetes in the UK

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Background: Evidence from research studies has shown that education programmes addressing carbohydrate counting and insulin adjustment for people with Type 1 diabetes show benefits in terms of both quality of life and glycaemic control. Structured education for people with diabetes is recommended by both Diabetes UK and the Department of Health in the UK, but there is little evidence for its effectiveness when applied in routine clinical care.

Aims: To design and implement an interactive structured education programme for people with Type 1 diabetes and to evaluate clinical outcomes and well-being at two years follow-up.

Methods: The InSight education programme was developed to utilise reflective techniques based upon concrete personal experience of diabetes self-management and encourages peer support. InSight is based upon theories of adult education including experiential learning and runs over 4 weeks with weekly sessions providing 15 hours total contact time. It is designed to facilitate skills for carbohydrate counting and insulin adjustment and supports self-management of hypoglycaemia, hyperglycaemia, illness and exercise. Data were collected at baseline, 6, 12 and 24 months after completion and included biomedical indices, the Problem Areas in Diabetes Scale (PAID) and subject evaluation forms.

Results: The baseline characteristics of 88 subjects (28% male) in Oxford, UK were mean (SD): age 44.6 (12.4) years, diabetes duration 23.6 (12.6) years, A1c 8.5 (1.4) %, body weight 71.8 (15.1) kg, BMI 25.6 (4.1) kg/m2, total cholesterol 4.8 (0.7) mmol/l, HDL cholesterol 1.7 (0.5) mmol/l, LDL cholesterol 2.56 (0.62) mmol/l and triglycerides 1.1 (0.9) mmol/l.

Analysis of 72 (82%) of subjects at 2 years showed a significant reduction in A1c of -0.2% (p=0.004), and a reduction in lipid levels including total cholesterol (-0.3mmol/l, p=0.003), LDL cholesterol (-0.28mmol/l, p=0.003) and triglycerides (-0.19mmol/l, p=0.04). There were no significant changes in body weight, BMI or HDL cholesterol.

PAID questionnaires were completed by 56% of subjects at baseline and after 1 year of the study and the results showed a significant decrease in diabetes-related distress. The mean scores at baseline were 32% and these improved to 19% (p=<0.001) one year after completing the InSight course.

Subjective evaluation showed high satisfaction levels with both the content and the process of the education programme.

Conclusion: Audit of the InSight education programme for people with type 1 diabetes has shown that there are significant improvements in biomedical outcomes and in diabetes-related distress and that these positive outcomes are maintained at two years follow-up.

No conflict of interest

P-1194

Enhancing self-care practices of adults with diabetes using self-efficacy education approach

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Background and aim: Previous studies from Malaysia have shown high prevalence of diabetes and diabetes complications among the local subjects. Diabetes self-management education has been shown to improve self-care practices and clinical outcomes. This study aims to assess the effectiveness of a self-efficacy diabetes education program.

Research design and methods: Using a longitudinal quasi-experimental design, 164 adults with diabetes were randomised to control and experimental groups from two settings. All subjects' glycated haemoglobin, diabetes knowledge and self-care practices, which included dietary and medication intakes, physical activity levels and self-monitoring of blood glucose (SMBG) practices, were assessed at baseline and 12th week. The intervention group received three monthly individual self-efficacy education sessions (2 face-to-face sessions and 1 telephone follow-up). Self-care practices and diabetes knowledge were assessed using a pre- and post-questionnaire (Cronbach's alpha = 0.86) administered using one-to-one interviewing approach. Analysis was done with descriptive statistics, 2-tailed t-test, Mann-Whitney U, Chi-square and multiple regressions.

Result: At 12th weeks follow-up, the intervention group had shown significant improvements in diabetes knowledge (p=0.001), HbA1c levels (p=0.01), SMBG practices (p=<0.001) and a small increment in physical activity levels (p=0.002) when compared with the control group. There was no significant improvement in dietary and medication self-care in either of the two groups. Within the intervention group, at follow-up there were statistically significant improvements in diabetes knowledge (p=<0.001), HbA1c level (p=0.001), SMBG practices (p=<0.001) and medication self-care (p=0.03) but not physical activity levels and dietary intake. Whereas the control group had slight improvements in diabetes knowledge (p=<0.001) and no change in HbA1c and all self-care practices. Seventy-seven percent of intervention subjects received all three education sessions There were significant relationships between total education time and SMBG practices (r=+0.38 p=0.001), medication adherence (r= +0.22, p=0.04) and diabetes knowledge (r= +0.34, p=0.02). Factors related to reduced education included transportation (rho= -0.31, p=0.006) and telephone access (rho= -0.28, p=0.01) problems. Medication adherence

(B=-0.23, p=0.009) and SMBG practices (B=-0.21, p=0.007) predicted the HbA1c levels at 12 weeks.

Conclusion: The self-efficacy diabetes education program was effective in improving knowledge, glycaemic control and self-care practices like SMBG, medication intake, but not dietary intake or physical activity. Social factors like telephone access and transportation problems appeared to reduce educational opportunities.

No conflict of interest

P-1195

The impact of a diabetes education programme on some non-glycaemic endpoints in Nigerians with type 2 diabetes mellitus

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Background and objectives: This study evaluated the effectiveness of a structured group education programme on non-glycaemic endpoints of diabetes knowledge, compliance with treatment and medical advice, use of monitoring devices and treatment satisfaction.

Methods: A cross-sectional comparative design was employed. Study participants were members of the local Diabetes Association (DAN) who had participated in a structured group education programme, and control subjects were outpatients with type 2 diabetes mellitus who had not registered as members of DAN and do not attend DAN activities. Self and interviewer administered structured questionnaires were used to determine study endpoints. The responses of study participants were analysed and then compared.

Results: Seventy-five patients were studied in each group comprising 78 males and 72 females. DAN members had good knowledge of their disease, complied satisfactorily with their medications and physician's advice, knew and used at least one monitoring device and had better knowledge of hypoglycaemia than control subjects. Treatment satisfaction scores were also higher among DAN members.

Conclusions: Diabetes associations and clubs provide a practical and acceptable means of disseminating diabetes related information and should be strengthened

No conflict of interest

P-1196

Evaluation of new educational program for type 2 diabetes patients on insulin therapy in Russia

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Background and aims: Number of type 2 diabetes patients on insulin therapy in Russia is considerably increasing. The purpose of the study was to estimate the efficacy of new-developed program for insulin-treated patients with type 2 diabetes.

Materials and methods: Structured educational program consists of knowledge questionnaire, curriculum, teaching cards, photos of food plates, posters and handouts. 216 type 2 diabetes patients on insulin therapy were divided into two groups: 90 patients were educated in clusters (group 1) and 126 individually (group 2). Patients were comparable with age (60.1±6.4 vs 58.3±7.2 yrs, p=1.0), diabetes duration (10.1±4.8 vs 9.2±6.7 yrs, p=0.8), insulin therapy duration (2.7±1.1 vs 3.1±2.0 yrs, p=0.7), number of patients on different regimes of insulin therapy, HbA1c level (9.1±2.7 vs 9.7±2.3%, p=0.7). There were more employees among patients educated individually (58.7% vs 35.6%, p=0.01). Clinical and diabetes-related parameters were estimated before, 6 and 12 months after education.

Results: Number of patients on basis-bolus therapy was increased: from 38,9 to 77,8% in group 1 and from 33,3 to 62,7% in group 2 (p=0.05). Significant changes in patients' diabetes-related behavior were revealed in both groups. Decrease in HbA1c level was obtained in six months after education in both groups: to 7.4±1.6% and 8.1±1.1% respectively. In 12 months after education, lowering of patients' activity in self-monitoring blood glucose, completion of logbook, self-adjustment of insulin dose were revealed; 46.7% patients from group 1 and 27.8% from group 2 inadequately reduced daily dose of insulin. HbA1c level was 8.1±1.7% a year after education in groups and 8.4±2.0% after individual education (p<0,05).

Table

Clinical and diabetes-related parameters	Group education			Individual education		
	Before	After 6 months	After 12 months	Before	After 6 months	After 12 months
Regular self-monitoring blood glucose, % of patients	28.9	82.2	68.3	32.5	80.9	70.3
Using logbook, % of patients	20.0	78.9	64.7	46.1	95.2	88.3
Self-adjustment of insulin dose, % of patients	6.7	75.6	65.6	30.2	84.9	77.0
HbA1c, %	9.1±2.7	7.4±1.6	8.1±1.7	9.7±2.3	8.1±1.1	8.4±2.0

p<0.05 (intragroup comparison)

Conclusion: Results of the study demonstrate the efficacy of structured program for type 2 diabetes insulin-treated patients. The program should be recommended for both group and individual education. Lowering of patients' self-activity and inadequate reduction of insulin dose seemed to be the barriers to optimal glycemic control. Further studies are needed to investigate factors associated with behavioral changes.

No conflict of interest

P-1197

ROMEO (rethink organization to improve education and outcomes): a multicentre clinical trial of the group care model to translate diabetes research into daily practice

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To reduce the preventable burden of diabetes we need to translate diabetes research into daily practice, with the aim of improving new knowledge, health conduct, health outcomes and improve access to quality health care. The Group Care (GC) approach, in which traditional individual visits are substituted by group education sessions, permits to obtain better organization of outpatient clinics while improving the clinical management of type 2 diabetes (T2DM) (Trento, 2001, 2002, 2004). The multicentre clinical trial ROMEO (Rethink Organization to iMprove Education) was planned to evaluate the applicability and reproducibility of GC in different outpatient facilities and to verify if its encouraging results can be reproduced elsewhere, while assessing its clinical impact on a larger patient population (Porta e Trento, 2004; Gentile, 2004). ROMEO was closed in 2007, and is now under statistical evaluation. This paper reports on the results of a purpose-built questionnaire administered to assess the process of implementation of GC in the centres participating in ROMEO and to verify the 'input-workout-output' method in an experimental framework. We identified areas to better understand the impact of GC on daily clinical practice and to ascertain if the GC approach helps achieving patient empowerment in building strategies to cope with T2DM as well as other types of diabetes and chronic conditions. Using the ROMEO language, both in GC and individual visits, a symbolic reference was identified to be shared within the team. The systematic use of metaphors expresses the value and the meaning of the changing process. The ROMEO centres identified further areas of implementation of GC: metabolic settings (Type 1 diabetes, metabolic syndrome, obesity, gestational diabetes, new diabetes diagnosis, dyslipidaemia, self-monitoring and continuous subcutaneous insulin infusion, nutritional self-management education, exercise and diabetes, psychosocial assessment and care) and, interestingly, in rehabilitative and oncological settings. All centres involved in ROMEO have completed an analysis of their internal organization and started re-thinking their organization to continuously improve their team performance and support changing clinical processes, defining and sharing ongoing objectives beyond the mere enforcement of the clinical trial.

No conflict of interest

P-1198

Diabetes self-management learning and adaptation process: weekly education program versus intensive program, the results

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Objective: This research compares the adaptation process to the disease of patients taking part in one intensive Diabetes Self-Management Education Program (DSMEP) (three-day session) or one weekly DSMEP (eleven-week two-hour session).
Method: A pretest posttest, non-equivalent control group, quasi-experimental design was used to compare the two DSMEP. Thirty-eight type 2 diabetic individuals correspond to the criteria of inclusion. In addition, qualitative semi-structured interviews, aimed at describing the evolution of the adaptation to diabetes, were completed with six type 2 diabetic individuals from both groups. All the data was collected from March 2005 until January 2006 in the Eastern Townships region of Quebec, Canada. Data analysis was made using SPSS and NVivo. The Adaptation Model to Diabetes Stress (Gosselin and Bergeron, 1991) was used as the framework for the research.
Results: No significant differences were found at pretest between groups except on gender (X^2=4,68, p=0,043*), urine tested by a health care professional for protein (X^2 =6,525, p=0,038) and referred or not to the program (X^2=8,782, p=0,032*). Participants also reported higher psychological distress than the general population. There was a significant program effect on the receptivity and adaptation to treatment (F=4,581, p=0,040*). Two significant program x time interactions were found on self-devaluation (F=4,052, p=0,052*) and the level of physical activity at work or as the principal activity (F=5,306, p=0,027*). Knowledge improved at the end of both programs and remained eleven weeks after (F=10,775, p=0,002**). The diabetic individuals interviewed report emotions that described the adaptation stages and psychological distress through time. The most important challenge in diabetes self-management was nutrition. Empowerment seems to reduce the psychological distress.
Discussion: Consistent with International Diabetes Federation (2006), our research points out the need to evaluate distress and adaptation process while participating in a DSMEP. In our sample, non-insulin-treated diabetic individuals present less psychological distress and more positive diabetes attitude. Therefore, they are in a positive stage of adaptation and have better social support. They also have a better perception of nutrition. Due to this, the weekly program presents positive results regarding the Body Mass Index and the level of physical activity through time
Conclusion: There is a gap between the needs of the type 2 diabetic individuals and the needs health professionals think they have. Further researches on how diabetes education programs should integrate literacy, psychological distress and adaptation process.

No conflict of interest

P-1199

The attitudes of nurses and physicians toward diabetes and its management

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Background: Diabetes is a major health care problem in Brunei and almost every health care provider (HCP) has to deal with person with diabetes. The non specialists are seeing increasingly more diabetes. Their attitudes towards diabetes are thought to be more important in improving outcomes than their diabetes-specific knowledge
The aim of this study is to explore the attitude towards diabetes amongst different HCPs who are not specialized in diabetes
Methods: The test tool was DAS-3 (Diabetes Attitude Scale-3) by Michigan Diabetes Research Training Center. DAS-3 contains 5 subscales; to capture the perceptions of health care providers on the need for special training, the seriousness of type 2 diabetes, the value of tight control, the psychosocial impact of diabetes, and the need for patient autonomy.
Random sample of nurses and physicians, who are practicing at hospitals and peripheral clinics in Brunei Darussalam were asked to complete DAS-3, Diabetologists, diabetes educators and dietitians were not included.
Mean scores for each of the five subscales of the DAS-3 were calculated. Scores on each subscales of the DAS-3 were compared by age, sex, and job categories Statistical testing was done with SPSS Statistics software, Version 17.
Results: 255 respondents, 62% were females, 58% were nurses and 70% were less than 45 years old.
The score mean 1.63±0.43 (Need for special training), 2.55±0.68 (Seriousness of type 2 diabetes), 2.73±0.55, (Value of tight control), 2.35±0.525 (Psychological impact of diabetes), 2.44±0.48 (Patient autonomy)
The attitude was negative for all DAS-3 subscales, the worst was for the need for special training, and it was also negative across all the age, sex and job categories. However males had higher score for seriousness of type 2 diabetes, older people scored better for seriousness of type2 diabetes and for psychological impact of diabetes, and physicians appreciate more the seriousness of type 2 diabetes, value of tight control and patient autonomy. (See the table)

		Need for special training	Seriousness of type 2 diabetes	Value of tight control	Psychological impact of diabetes	Patient autonomy
Age	< 45	1.70±0.44	2.44±0.63	2.71±0.50	2.20±0.47	2.36±40
	≥ 45	1.56±0.40	2.6±0.70	2.74±0.56	2.49±0.57	2.40±0.58
	P value	0.81*	0.05*	0.50*	0.019*	0.76*
Sex	Female	1.67±0.43	2.47±0.65	1.63±0.43	2.30±0.49	2.44±0.47
	Male	1.58±0.42	2.68±0.70	2.77±0.59	2.41±0.58	2.43±0.50
	P value	0.103*	0.016*	0.115*	0.17*	0.97*
Job	Nurse	1.65±0.44	2.34±0.60	2.60±0.43	2.30±0.54	2.36±0.48
	Physician	1.60±0.44	2.92±0.72	3.00±0.65	2.46±0.50	2.56±0.49
	P value	0.428*	<0.0001**	<0.0001*	0.34*	0.001

**Mann-Whitney Test, ** One Way Anova*

Conclusion: The nurses and doctors appear to have a negative attitude towards diabetes, especially for the need for special training. Such negative attitudes may affect organization of effective diabetes care. Therefore we are faced with a challenging problem of influencing the attitudes of healthcare providers towards diabetes.

No conflict of interest

P-1200

Use of Western education programmes in Non-Western population is not recommended: Need exists to develop locally relevant education programmes in local languages when English is not the first language

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Introduction: India with largest number of people with diabetes has very limited and unstructured diabetes education. Western programmes may lose their impact by being over-complicated as people in developing countries have had no previous diabetes education. Diabetes education programmes are not available in India.Use of Western education programme in Non-Western population has not been studied before.
Aim: Impact of group education, using The Alphabet Education Programme, used in South Warwickshire in United Kingdom, was studied in our pilot study in India. We assessed the existing level of knowledge, self-efficacy and attitude of the people, biomedical outcomes [HbA1C, lipids, blood pressure (BP), weight and fasting blood glucose (FBG)] in people with type 2 diabetes mellitus. This was a pre and post intervention (3-months after).
Method: 8-hours of structured diabetes education, delivered in four, 2 hours long weekly sessions using the Alphabet Education Strategy was delivered in people with diabetes in Jaipur,India. Modified Michigan questionnaire were used to assess the impact of the education programmes before and 3-months after the end of the education programme. Blood results were collected (before and 3-months after last contact with educator).
Results: 15 participants (9 male,6 female) completed the study. Results are shown as mean±standard deviation. Their mean age was 61.4±7.24, duration of diabetes was 7.5 years. Changes in different parameter at baseline vs 3-months: HbA1C 7.6±1.1vs7.9±1.7, systolicBP 144±13vs142±13, diastolicBP was 89±7vs85.2±7.7, total cholesterol 187±46.4vs177±39.5, triglyceride152±77vs153±58,FBG 156.0±48.3vs160±48.6 (all units mg%). Participants' levels of knowledge and self-efficacy score improved immediately after the intervention but returned to baseline at 3-months.Attitude towards diabetes improved significantly (correct response rate 3.49 vs 3.77,p=0.01) and continued to improve.

Summary: The education programme was well attended and liked by the participants. Our pilot study show that an important component of diabetes care is missing in India. This is reflected in participants' baseline knowledge and self efficacy score which improved immediately after education but returned to base line at 3 months period. Attitude towards diabetes continued to improve after end of education. This shows the need of continued input. Improved attitude show the benefits of diabetes education. Use of non-familiar phrases in the Western programme and in assessment tool, to education naïve cohort, may have caused ambiguity in participants' responses and distorted the results.
Conclusion: Diabetes education programmes and assessment tools should be in local languages and use culturally sensitive phrases, understood by participants. These should be assessed and validated in terms of various outcomes. Use of Western education programmes in Non- Western population is not recommended.

No conflict of interest

P-1201

An educational programme for Diabetes Care: Climbing all the way up the Kirkpatrick hierarchy of evaluation of teaching

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Background: Kirkpatrick's hierarchy of evaluation of teaching can be summarised into 4 levels: Reaction, Learning, Behaviour change and Outcomes. Usually educational programmes only evaluate at the first level. In clinical practice it is outcomes that we are trying to achieve.
Aim: To evaluate an innovative locally created clinical education strategy for diabetes care using Kirkpatrick's hierarchy.
Method: Alphabet Strategy is a patient-centred, evidence-based strategy based on the most important aspects of diabetes care: Advice, BP, Cholesterol, Diabetes Control, Eyecare, Footcare, Guardian Drugs.
Main results:
Level 1: Reaction
Healthcare professional Education programme
Delivered on over 20 occasions as part of a clinical education programme. Evaluations have been consistently positive.
GAIA Survey (Global Alphabet Strategy Implementation Audit)
Survey in 35 diabetes centres in 25 countries revealed that 57.5% of 146 healthcare professionals felt they were likely to adopt the strategy. 84.5% felt it was evidence-based and 88.0% practical.
Level 2: Knowledge Skills Attitudes acquired
Patient Education Programme
Knowledge of diabetes care was evaluated in 100 patients, which showed a significant improvement from 61.5 % to 80.0% ($p<0.01$).
i-DREAM Programme (interactive Diabetes Research Evidence Application in Management)
In 100 multi-professional healthcare workers, improvement in clinical management plans, application of evidence-based research and correct prescribing scores (69% before, 98% afterwards ($p<0.001$)) in 100 clinicians on case studies.
Level 3: Changes in Professional Practice
ASIAD Study (Alphabet Strategy- Indian Application for Diabetes)
Implementation in an economically deprived clinical setting in India. Within 4 months there was improvement in the 100 patients studied ($p<0.01$). Main changes were: improvement in cholesterol profile (60% to 90%), statin use (5% to 38%), aspirin use (6% to 71%), proteinuria assessment (48% to 93%).
Diabetes In-patient Care Evaluation
Data was collected on quality of care before and after implementing this strategy (100 patients). There was significant improvement in 9 of the 10 main parameters of care ($p<0.05$).
Level 4: Patient Outcomes
POEM Clinical Audit (Practice Of Evidence-based Medicine)
Over 5 years BP, Lipid profile, diabetes control, eye and feet screening improved. CVD risk score improved from 31.2% to 23.7% ($p < 0.05$).
Our strategy has been shown to produce outcomes comparable to the intensively- treated cohorts of the UKPDS and Steno-2 studies.
Conclusion: This free, public domain strategy has helped deliver high quality patient education and reduction in CVD risk, catering for all 4 levels of Kirkpatrick's Hierarchy for evaluating an education programme. Such a programme has considerable potential to improve diabetes care.

No conflict of interest

P-1202

Community-based diabetes prevention and management education program in Nepal.

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Aim: In this study we evaluated a 7-month community-based nonpharmacological lifestyle intervention to prevent/reduce the risk of developing diabetes and its complications in a resource-poor village in Nepal.
Methods: A total of 203 village inhabitants, comprising adults and youth aged 10-92 years, were provided educational intervention using "trained trainers." Culturally and linguistically appropriate health education messages addressed diet, physical activity, and knowledge improvement. The prevalence of diabetes and the effectiveness of the intervention were assessed using select parameters.
Results: The crude prevalences of diabetes and pre-diabetes among adults were 5.1 and 13.5%, respectively, while the prevalence of pre-diabetes in youth aged 10-17 years was 5.1%. Intervention reduced fasting blood glucose levels of pre-diabetic adults by 11%, pre-diabetic youth by 17%, and type 2 diabetic adults by 25%. Improvements in obesity parameters and dietary intake also occurred. A stepwise worsening of parameters progressing from the normoglycemic state to the impaired levels of pre-diabetes and diabetes was observed.
Conclusions: This study has charted the increasing prevalence of diabetes and pre-diabetes in Nepal. Educational intervention was successful in reducing some of the obesity parameters and improving dietary patterns of individuals with pre-diabetes and diabetes.

No conflict of interest

P-1203

The role of the community pharmacist in Japan: knowledge, attitude, and confidence in diabetes education

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In Japan, the number of people with diabetes or a condition of impaired glucose tolerance increased by five million from 1997 to 2006. As the number of cases of diabetes and the cost of medical care rise, there is increasing pressure on the health care system to provide more intensive care to more patients with diabetes. Community pharmacists are well positioned to take an active role in diabetes education because they can interact readily with other members of the disease management team such as general practitioners. Community pharmacists are ideally placed to assist in the education of diabetes patients, because they are accessible, available, and in frequent contact. So, we conducted a survey involving community pharmacists diabetes care in Japan.
Aims: To describe Japanese pharmacists' involvement in diabetes care, to investigate pharmacists' attitude, and to clarify pharmacists' confidence regarding diabetes care education on advising diabetics in community pharmacy.
Methods: In total, ninety-six pharmacists based in Japan received a questionnaire. The questionnaire covered areas ranging from confidence in diabetes education skills, to the pharmacists' views on which services the pharmacy should offer to promote diabetes care.
Results: All ninety-six questionnaires were completed. Ninety-two percent of the pharmacists had experience of being asked for advice other than on medications. A large proportion questions were about the assessment of laboratory examinations, healthy diets, supplements, diabetes-related complications, physical exercise, and weight loss. Sixty-four percent of the pharmacists state their desire to support diabetics in community pharmacy. The scores of educational confidence regarding the diet and physical activity were lower than those for medication and communication skills. The scores to assess knowledge regarding the diet and physical activity were relatively lower than those for medication and clinical evidence. Sixty-seven percent of the pharmacists said questions on the assessment of blood test results were the most often asked.
Conclusion: The results suggest that most community pharmacists counsel diabetics on lifestyle issues, even though their educational skills concerning diet and exercise were lacking. To improve pharmacists' knowledge, attitude, and

confidence regarding diabetes education, may be effective a workshop training program for pharmacists.

No conflict of interest

P-1204

The Abhilasha training programme for diabetes educators

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This paper reports on the results of a novel training programme, Abhilasha, designed for nurses and diabetes counsellors, by DRFHE (Dr Reddy's Foundation for Health Education), the CSR arm of Dr Reddy's Laboratories Ltd. The word abhilasha means aspiration in Hindi. The programme focuses on both the science of diabetes care and on motivational training, and is a two day long workshop spread over 12 working hours, utilizing lectures, group discussions, film shows, role-plays and presentations by participants.
22 participants completed the pilot training programme at Karnal, India. They included 7 men and 15 women, of whom 10 were nurses, 3 had postgraduate qualification, while 9 had other degrees and diplomas. All participants were aged, 30 years, and experience in diabetes care ranged from 3 months to 3 years. Average number of patients counselled per day varied from 20 to 60 per day.
Participants were given structured, pretested, Likert scale-based questionnaires prior to, and after the programme, to assess their felt needs, and their opinions about the workshop. Questions were asked about the type of pedagogic methods they preferred, and about the relative importance of the modules taught in Abhilasha.
Nurses rated diet (4.4±1.26), insulin motivation (3.8±1.23) and stress management (3.9±1.37) as important topics in a pre-workshop assessment. Non-nurses felt that insulin motivation (3.9±1.24), handling difficult patients (3.8±1.27) and knowledge of antidiabetic drugs (3.1±1.64) were important areas. Least importance was given by both nurses and non-nurses to reproductive/sexual care (1.5± 1.08, 2.0± 0.90) and eye care (1.70.95, 2.3±1.23).
Non-nurse participants rated role-play (3.0±1.21) as the best method of learning, while nurses felt that films (3.8±1.48) would be the most effective method of training.
On completion of the workshop, maximum rating was given to modules on Team work/building, and Motivation, by nurses (5.0±0.0 each). Non-nurses gave a similar rating to the module Understanding self and others.Least rating was given to Importance of work by nurses (4.2±1.26) and to rapport building and stress management by non-nurses (4.2±0.75). Each feedback mentioned that oral antidiabetic drugs and other drugs used in diabetes were not covered adequately.
The paper highlights the positive impact of the Abhilasha training programme. It shows the feasibility of conducting joint training programmes for nursing and non-nursing staff, covering both the science and art of diabetes education, using an eclectic mix of pedagogic methods. It points out the preferred teaching methods, and the relative importance that should be given to various topics while planning such programmes.
This training programme should be adopted in other parts of the world.

No conflict of interest

P-1205

Education for diabetes self-management improves quality of life and reduces HbA1c levels in people with diabetes

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Backgrounds and aims: Knowing about patient's quality of life (QoL) is becoming increasingly important in delivering diabetes care and education. The purpose of our study was to estimate if the diabetes education improves patient QoL and reduces HbA1c levels.
Material and methods: The study sample included diabetic patients who attended a 5-day educational sessions at the Service of Endocrinology in Tirana/Albania. Patients were evaluated regarding their QoL at baseline and 6 or 12 months after their hospitalization. The HbA1c was measured at baseline, 6 and 12 months later. The DQoL (Diabetes Quality of Life) measure was used to assess the subjective QoL. DQoL is a validated 46 items survey covering four areas of interest: satisfaction and impact of treatment, worry about the future effects of diabetes and worry about social issues, as well a single question about the general health. A satisfactory level is accepted as a transformed score >60.
Results: The group consisted of 395 patients, 139 males (35%) and 256 females, 97 (24.5%) type 1 diabetes, mean age 44.2±4.7 years, diabetes duration 11.4±5.4 years, treated with insulin in 45% of cases, with baseline HbA1c 9.1±1.67%, having decreased respectively to 8.5±1.1% at 6 months ($p<0.05$) and 8.02±1.23% at 12 months after hospitalization ($p<0.001$). DQoL at baseline was 56±4.5, 68.2±5.7 six months later and 75.1±3.5 at 12 months interval ($p<0.05$). The satisfaction with treatment and worry about the future were the most improved scores at six and 12 months after.
Conclusions: The education for diabetes self-management improves patients' Quality of Life as well as their metabolic control.

No conflict of interest

P-1206

Weight loss and improved glycemic control: results from an interdisciplinary group-based weight management program

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Background and aims: Weight management is an important element in diabetes care. However, losing weight is a real challenge for most people and balancing diabetes and weight issues can be overwhelming. Strategies such as caloric restriction, increased energy expenditure and behaviour modification have been demonstrated to be effective in terms of weight loss and glycemic control among individuals with type 2 diabetes. Group-based weight management programs provide many opportunities for individuals to learn strategies and to identify with others. This study examined weight and A1c changes in individuals participating in a group-based weight management program.
Materials and methods: We studied a cohort of overweight or obese individuals with type 2 diabetes who participated in a group-based weight management program in 2008. Objectives of the program included: 1) weight loss; 2) increased physical activity, 3) improved food choices; and 4) awareness of healthy eating behaviours. The program consisted of 13 weekly group sessions led by a dietitian, kinesiologist or social worker. Data was collected at the beginning and end of the program.
Results: 37 overweight or obese program participants (14 males, 23 females) of mean age 59.8 ± 8.5 yrs treated with diet alone (5.4%), oral agents alone (40.5%), insulin alone (29.7%) and insulin +oral agents (24.3%) were studied. Their mean weight, BMI, waist circumference and A1C were 108.6 ± 18.4 kg, 37.7 ± 6.6 kg/m^2, 121.6 ± 13.0 cm and 7.4 ± 0.8 respectively. 15 individuals (41% of cohort) were assessed before and following participation in the group-based weight management program. Compared to baseline, the mean change in weight, BMI, waist and A1C were – 3.6 ± 4.4 kg ($p<0.01$), -1.4 ± 1.5 kg/m^2 ($p<0.005$), -2.6 ± 4.7 cm ($p=0.051$) and – 0.5 ± 0.2 % ($p<0.005$) respectively. All participants reported feeling more confident in their ability to make changes in physical activity levels, dietary choices, and to cope with emotional triggers to eating. Identified areas of improvement with respect to the program included: 1) regular monitoring and feedback of food diaries; 2) more physical activity; 3) more behaviour modification strategies.
Conclusion: Participation in an interdisciplinary group-based weight management program which incorporated healthy eating, physical activity and behaviour modification along with diabetes management resulted in significant weight loss and improvement in glycemic control after 13 weeks. Based on program evaluation, the program has added: 1) individual consultations with a dietitian; 2) mandatory 30 minute physical activity with each session; and 3) involvement of a health psychologist.

No conflict of interest

P-1207

Evaluation of a diabetes education program using group and individual strategies, Brazil

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Objective: Compare two strategies in a Diabetes Education Program: individual and group education.
Method: Patients with type 2 diabetes at an outpatient department and enrolled in an education program of the teaching hospital of Belo Horizonte, state of Minas Gerais, were selected randomly and placed randomly into two groups: group education (54 patients) and individual education (50 patients). The group education was done in three meetings a month, which involved play and interactive dynamics. Simultaneously, another group was monitored individually. this was done for six months and the following elements were evaluated: Knowledge of Diabetes (DKN-A), Psychological Attitudes (ATT-19), Change in Behavior (ESM), Quality of Life (SF-36) and clinical evaluation (HbA1c and Body Mass Index – BMI) at the beginning (T0), after three months (T3) and 6 months (T6) of intervention.
Discussion: The change in eating habits and physical activity in patients with type 2 DM, as a result of the program evaluation in education in group and individual diabetes, subject to the improvement of knowledge and change of attitudes about the disease. The whole process aims to control blood glucose and improve the physical and mental conditions of individuals. The quest to achieve change in behavior to self care, developed in the program of education in groups, through education, health promotion and access to information from health professionals. Education and knowledge transfer is a difficult process, especially for diabetes, a disease that affects individuals of all ages, with different educational levels and with different social and environmental databases.
Results: The sample was made up of 104 patients with type 2 diabetes, with an average age of 60.6 years. The results of group and individual education were similar in the tests of attitude, change of behavior and quality of life. A reduction in the levels of HbA1c was observed in both groups, but only in the group education a statistically significant difference ($p = 0.012$) was found.
Conclusion: Both diabetes education programs were effective, however, group education was superior to individual education in obtaining better glycemic control.

No conflict of interest

P-1208

Evaluation of knowledge gained through diabetes education sessions in a rural area (Cameroon)

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Background and aims: Education is an essential tool in diabetes management. In Bafang rural area where there are no specialists, the local branch of Cameroon Diabetes Association developed a strategy to educate diabetes patients using vernacular when needed in its monthly meetings from November 2007 to October 2008. Using donation of posters mostly in English to a population whose first official language is French, and considering ignorance of members on diabetes management, there was a need to evaluate the knowledge gained by local association members that attended educative sessions. To develop tools that will increase participation in diabetes educational sessions in the rural area.
Methods: Use of a questionnaire (during a normal session) formulated at the National Center of Obesity and Endocrinology of Yaoundé Central Hospital, Cameroon, designed to evaluate therapeutic education.
Results: Present at the meeting were 25 persons, of whom 15 participated. 9 of these were registered members of the local association, 5 had diabetes but were new comers and 1 was not a diabetes patient. Of all registered members, 66% attended meetings only once, 16% attended 2 times, 13% attended 3 or 4 meetings, and only 5% attended > 5 meetings.
Most participants (73%) defined diabetes as an excess of sugar in the blood and identified a glycemia test as the test that permit to measure the quantity of sugar in the blood. Only 20% of participants related elevation of sugar to an impaired function of insulin and defined glycated hemoglobin as the test that helps to appreciate the variation of glycemia during the past three months; 2/3 of them were regular meeting attendants. 53% noted the target range goal for a fasting blood glucose test as 0.70-1.20 g/l; of whom 75% attended education sessions. Few (27%) identified the post prandial glycemia test target: of whom 75% were regular meeting attendants. The majority (80%) noted 140/70mmhg as the goal for adult blood pressure measuring and could enumerate some complications of diabetes. 47% perform glycemia tests only when need arise, 40% do it once per month and only 13% do it regularly, at least each week. All participants agreed on the benefit of physical activity to the lowering of blood glucose.
Conclusion: Knowledge about diabetes care was gained by those who attended education sessions as evidenced by specific knowledge about the disease and the appreciation of goals to achieve for its management. Significant knowledge deficits remain however, and delivery of more education is required. The provision of tools including glycemia testing at a lower cost, education materials associated with the rural context, and in particular translation in the local vernacular, are likely to assist in disease self-management.

No conflict of interest

P-1209

Knowledge, attitudes and practices regarding diabetes among diabetic patients in Multan

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Aim: The aim of this study was to assess the knowledge, attitudes and practices regarding diabetes among diabetic patients visiting a tertiary care hospital in Multan, Pakistan.
Methods: This cross-sectional study was carried out on 250 diabetic patients attending diabetes clinic at Nishtar hospital, Multan. The patients were interviewed using standardized questions. There were a total of 15 questions related to knowledge about diabetes covering description, symptoms, complication and prevention of diabetes. There were five questions each for attitude and practices of patients regarding diabetes. Consent was taken before interviewing the participants.
Results: The mean age of patients was 46.03 ± 11.37 years. Majority of the patients were female (55%), literate (59%), married (91%), non-smoker (88%) and from urban locality (73%). Body Mass Index of patients was 26.40 ± 4.6 and fasting blood glucose level was 176.21 ± 61.55 mg/dl. Analysis revealed that 65%, 73% and 54% of the respondents correctly answered 50% or more questions on knowledge, attitude and practices regarding diabetes. Knowledge and attitude were found to be positively correlated ($p<0.05$) while no correlation existed between attitude and practice. Sources of information of patients were physician (78%), T.V (32%), Newspaper (17%), and Radio (12%). 55% patients said they were careful about education regarding disease and 15% patients were of the view that they were being stigmatized.
Conclusion: The results show that an increase in knowledge will result in better attitude regarding disease, however, the same does not hold true for relationship between attitude and practice. The study suggests the need for structured diabetes educational programs to improve the knowledge, attitude and practices of the diabetes patients. This will lead to attainment of desired blood glucose levels in majority of patients, preventing complications.

No conflict of interest

P-1210

Nutritional status and its relation to weekly mean glycemia (WMG) of type 2 diabetic patients from the diabetes education and control group (DECG) before and after interdisciplinary intervention

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Nutritional status of type 2 diabetic patients reflects how the intervention of the health professionals should be conducted in order to achive ideal glycemic control. The Diabetes Education and Control Group (DECG) from the Kidney and Hypertension Hospital - Federal University of São Paulo, Brazil proposes a new treatment strategy for type 2 diabetes mellitus using the concept of Weekly Mean Glycemia (WMG). It intends to direct the treatment based on a mean value of the blood glucose related to capillary glycemia tests performed on 3 consecutive days, 6 times a day. Data of WMG and Body Mass Index (BMI) of 85 patients followed by the DECG during 2007/08 were analysed.

Results: 15 registries had been excluded for lack of information resulting in a sample size of 60. Pre-intervention data: total sample BMI was 30,41kg/m2, being 28,38kg/m2 for men and 31,78 for the women; 15% of the total group had normal weight, 32% were overweight, and obesity grades I, II and III were respectively 32%, 17% and 5% considering World Health Organization classification criteria (1998). Among men, 52% were overweight and among women 38% showed obesity grade I and 22% obesity grade II. In relation to WMG, 65% started the treatment with a glycemia ≥ 150 mg/dl (bad control) being 27% men and 38% women. The mean WMG for the group before intervention was 188,57 mg/dl, being 184,01 mg/dl for men and 191,41 mg/dl for women. Post-intervention data: the mean counseling sections was 8,6±4,6 for patient. The mean BMI was 31,07 kg/m^2; men did not show mean alteration; the 3% increase (mean BMI of 32,74 kg/m$^{2)}$ was for the female group. In this group 8% migrated from obesity grade I to obesity grade II. In relation to WMG, 67% presented good control (< 150 mg/dl), showing an improvement of 32% in relation to the beginning of the treatment. Women showed a 24% reduction in WMG even starting the treatment with higher values than men (20%). Of the 33% maintaining bad control, 20% were women. In conclusion it can be said that there was a significant improvement in glycemic control; women showed bigger BMI values before and after treatment and for this period they also composed the bigger percentage in bad control. This indicates that for the female population, health care diabetes care professionals should change their approach in order to improve glycemic and weight control.

No conflict of interest

P-1211

Impact of World Diabetes Day commemoration

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Aim: To assess the impact of World Diabetes Day commemoration on diabetes care in our society.
Method: Data of the patients who registered for the diabetes day programme was compiled. Observations were made on the methods of diabetes awareness executed and its impact on the participants.
Results: World Diabetes Day was commemorated on 14th November at a community hall in Thiruvananthapuram. A prominent vernacular daily assisted in the programme by announcing the event and encouraging its readers to register. 400 patients registered for the programme. An awareness lecture was held with the help of audio visual presentation to enlighten the participants on comprehensive management of diabetes, which called for evaluation of status of diabetes, complications and associated diseases. 178 patients voluntarily opted and underwent the comprehensive evaluation. A magazine on diabetes care in the local language was also released during the occasion. All the patients were given a free copy of the magazine. 120 patients also bought a book on diabetes. Patients showed keen interest in the proceedings and were present throughout the entire duration of the programme which lasted four hours.
Discussion: Diabetes education plays an important part in management of diabetes. Patients need to be made aware about control of blood glucose and associated diseases. They also need to be motivated to undergo comprehensive management of diabetes, whereby the prevalence or risk for complications and associated diseases too need to be managed along with diabetes. The impact of World Diabetes Day commemoration in imparting such awareness is found to be huge. Huge crowd of four hundred patients participated in the programme. All of them showed keen interest in various education modalities like lectures, magazine and book on diabetes. 44% of the participants further underwent comprehensive evaluation of diabetes which helped to control their disease better.
Conclusions: World Diabetes Day commemoration has a huge impact on propagating diabetes awareness in the society. Participants are a group of motivated patients willing to undergo education and comprehensive management of diabetes.

No conflict of interest

P-1212

Impact of physical activity: recreational and educational, on life quality of diabetics

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Diabetes mellitus (DM) is considered one of the main chronic diseases nowadays due to its high prevalence and high rates of morbidity and mortality. Currently, it represents one of the main problems of public health in Brazil and in the world, highlighted by the increase in proportions epidemiological relating to the increase in rates of obesity and overweight in all age groups. In the city of Uberaba, there are 8 years, is realized activity physical-recreational and educational on World Day of diabetic.
Methods: In the population who participated in the event was performed questionnaire, on the knowledge about the disease, changes in habit, acceptance of the disease, glycemic control and weight, physical activity, number of medical consultations, personal hygiene, self-esteem and quality of life of these people. Data were analyzed by SPSS 14.0 program and through the chi-square with a significance level of 5%.
Results: Of the 126 participants from gymkhana, 55 (43.7%) did not reply to the questionnaire on changes in their lives offered by gymkhana. Among 71 individuals, were identified the following changes after participation of activity: 9 (12.7%) gained acceptance of the disease; 12 (16.9%) improved glycemic control; 4 (5.6%) monitored the weight; 2 (2.8%) refer change in the quality of life; 10 (14.1%) refer improved self-esteem; 8 (11.3%) relate two changes; 5 (7%) referred three changes; 7 (9.9%) refer four changes; 13 (18.3%) refer five changes or more; and 1 (1.4%) does not change. In this group, only 28.6% were diabetics. With respect to psychological aspects, 44 (34.9%) did not answer this question. Those who replied (82-65.1%), 16 (19.5%) reported low self-esteem; and 51 (62.2%) high self-esteem. In this group, only 32.1% were diabetics. There was no relationship between the change in quality of life and diabetes (X^2=7.570, p=0.477), nor esteem and diabetes (X^2=6.003, p=0.199).
Conclusions: Due to the small proportion of participants who had diabetes GIDIUBE (28.6%), was not possible to affirm the GIDIUBE significant relation with the improvement of quality of life only in the group of diabetic patients. However, there is a marked change in the quality of life of people in general participants of the project, improving their standard of living and mainly, to self-esteem. Therefore, the activities promoted in gymkhana diabetics of Uberaba are so important as regards the prevention and promotion of health of this municipality.

No conflict of interest

P-1213

The current access to diabetes journals in the Middle East, hard copy versus online versions

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Background: The Egyptian Diabetes Center is currently publishing the Clinical Diabetes Journal as an official Journal of the American Diabetes Association in the Middle East & North Africa in addition to an online journal (onlinediabetes Journal) on its official web site.
New technologies are advocated as a means to overcome current barriers to get enough diabetes knowledge for Diabetes Health Care providers. Little is known, however, about the current usage or attitudes towards such technologies among Diabetes Health Care Providers.
Methods: A 2-page questionnaire was mailed to 1076 Health Care Providers seen in a diverse group of 79 diabetes care clinics in Eastern Mediterranean Region affiliated with a single academic health center. Current technology use, attitudes towards new wireless technologies, self-reported adherence, and efficacy were assessed compared to hard copy journals.
Results: Respondents reported frequent use of the internet (72.1%), and email (54.5%), versus hard copy publications (27.9%). Barriers to technology adoption included privacy concerns (52.5%) and lack of confidence in technology (34.8%).
As for the advantages of the online journals: Speed 66.8%, Ease of searching 88.4%, Interactive 34.5%, Accessible 52.1%, Links 33.4%, Added Value 54.3%, Inexpensive 92.7%, Flexibility 55.4%.

Disadvantages of online journals: Difficulty in reading computer screens 34.3%, indexing 23.3%, archiving 22.3%, perishable Citation 24.6%, Authenticity 34.3%, search engines ignore PDF files 62.4%

Conclusions: Our results suggest that most Diabetes Health Care Providers would be willing to use innovative wireless technology to get their knowledge about diabetes & its related disorders. However, barriers to adoption among technologically marginalized Health Care Providers must also be addressed.

No conflict of interest

P-1214

Therapeutic adherence as a result of effective health educational programs on diabetes

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Introduction: Educational processes, once implemented might improve one's behavior in such way he or she might adopt a different life style in order to prevent complications from diabetes. An obstacle for a successful prognostic of diabetes is the low adherence of patients to conducted precognitive therapies.
Objective: to maintain the importance of a health education for diabetics as a tool for adherence and adequation in and to several available therapies. Methodology: review of the literature in the following database: LILACS, BVS/MS, ENSP, FSP, PAHO, e MEDLINE. Articles published from 2005 to 2009 were consulted.
Results and Discussion: Reviewed studies have proved the importance of an appropriate intervention through an individual approach, once the daily care with the disease depends on the diabetic. Thus, actions such as health promotion, identification of determining factors on the health-disease process and the treatment of diabetes being performed through activities of "self-assistance" shall undertake welfares for diabetics; this self-care has been pointed as the main objective of Health Educational Programs. In this context, the individual must be seen through a holistic approach, this takes into account his/her experiences, besides biological, psychological, social, cultural and economic aspects, as well as his/her capacity of self care.
Conclusion: The benefits of health education can be visible for patients, their families and society as long as people verify that a better perception of the diabetic about his/her own condition contributes significantly for a favorable prognostic of the disease.

No conflict of interest

P-1215

Diabetes mellitus: a nutrition education case study

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Despite recent technological advances in diabetes diagnosis and treatment there is a percentage of patients with no treatment compliance. Patients usually complain about few professional contact time in the public health care system. The key to this problem is education which consists of a continuous and interactive process to promote health style changes aiming at better life quality. The following case study reports a life style change through improving food habits and glycemic control. Patient GSR, male, 52 years old and history of type 2 diabetes of 13 years, treatment with metformin 850mg 2x/day and glibenclamide. Patient was sent to the Education and diabetes Control Group (EDCG) - the Kidney and Hypertension Hospital from Federal University of São Paulo, Brazil. The group is consisted of a multidisciplinary team (physicians, nutritionists/dietitians, nurses, physical educators, psychologists and diabetes educators). The patient was followed for 7 months (weekly at the first 2 visits and monthly later on). At the begining a nutritional assessment was performed including data about anthropometry, social and demographic aspects, food habit, a 3 day food record diary and 3 day glycemic profile (glycemia before and after main meals).
Results: patient was overweight (body mass index of 28,9kg/m2), waist circunference of 102cm. The diet was high in carbohydrate and lipid and low in fiber. The mean glycemia was 161mg/dl with a glycemic variability of 48. On the basis of these information a food plan was established considering the patient´s food habit, financial situation aiming at an improvement of his nutritional status, glycemia and comorbidities´control. At each meeting a new nutritional assessment was performed as well a 24h-food record in order to observe compliance and doubts on following the prescriptions and glycemic profile. The guidelines were reinforced at each visit. After the EDCG intervention it was observed compliance in relation to the nutrition and physical activity plans. The anthropometric parameters were improved observing a loss of 5.6% on the initial weight and 2.2% on waist circumference. A significant change on glycemic indexes was also observed: mean glycemia of 99mg/dl and glycemic variability of 20, showing a reduction of 38% on the mean glycemia. It can be concluded that the compliance to a diabetes control plan is founded in education tools improved by a multidisciplinary team and that changing nutrition aspects can result in a better diabetes control.

No conflict of interest

P-1216

Educational activities to improve compliance to treatment among elderly diabetic people: complicators and facilitators of the process

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Introduction: Effective actions for health education of the elderly diabetic increase the adherence to therapies used and, consequently, to clinical evolution. Objective: Evaluate educational actions which favorably improve adherence and clinical evolution of elderly diabetic patients.
Methodology: Review of literature on databases: LILACS, AdSaúde, HISA, PAHO, WHOLIS, MEDLINE and PubMed. Two groups of indices were used as follows: complicators and facilitators. Articles published from 2000 to 2008 were consulted.
Results: Complicators: educators without didactic-pedagogical skills; programs aiming at glycemic control only; patients: fear of the disease, complications and death; difficult access to medicines and materials; monitoring: professional-patient of mutual requirements relationship; programs not tailored according to patients profile. Facilitators: psycho-educational programs, taking into consideration social, emotional and communication components as well as motivational techniques as part of the operational proposal are associated with increase in quality of life; individual aspects considered (acceptance of the condition, self care, experience, ability to learn, motivation, self-confidence) propitious environment with resources available, qualified professionals and family participation; exchanging experiences increases self-esteem; multi-disciplinary and multi-professional approach; flexible educators and tolerance to frustrations about the results; achievable targets and evaluation of results.
Conclusion: Programs developed whose purpose is the health education for elderly diabetic patients, should be carried out with a multi-professional staff, and this one must be trained technically and pedagogically to perform their job efficiently, which is to help patients, keep health and face adversities triggered by the disease.

No conflict of interest

Peer education

P-1217

Planting seeds for grassroots: Diabetes among Utah Pacific Islanders

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Type 2 diabetes prevalence is especially high among Pacific Islanders. The International Obesity Taskforce has called Pacific Islanders "the fattest people in the world." The state of Utah has the highest percentage of Pacific Islanders in the mainland U.S., but Pacific Islanders still comprise less than one percent of the state population. Unfortunately, most public health interventions address the majority population, and not enough attention is given to the excessive rates of type 2 diabetes and its risk factors in the Pacific Islander community. Because this population comprises such a small minority, their voice is not well heard in the public health forum. Furthermore, many complications suffered by

Pacific Islanders might be prevented if more culturally appropriate interventions were available.
The National Tongan American Society (NTAS), a community-based organization headquartered in Salt Lake City, Utah, collects data to study the root causes of diabetes in this population. Data include quantitative data from the 2008 Healthy Living in the Utah Tongan Community (HLUTC), as well as qualitative data from focus groups and key informant interviews.
Self-reported data from the HLUTC (n=390) showed the cultural significance of offering and sharing food as signs of nurturance and respect. Over half (55%) of Pacific Islander adults were obese (body mass index of 30 and over), yet most (86%) perceived themselves to be only moderately overweight or not overweight at all. The survey also examined dietary habits. Statistically significant associations with frequency of sugared drink consumption ($p < .05$) and "fast food" consumption ($p < .05$) with obesity were found. Qualitative data from three focus groups showed the generally fatalistic belief that diabetes could not be prevented but pointed to the need to hear about prevention efforts from a trusted community member. Family history of type 2 diabetes is pervasive. Ongoing key informant interviews draw attention to the recurrent amputations, vision loss, and premature death related to diabetes.
NTAS works to reduce diabetes, its risk factors, and its complications. NTAS trains lay people to conduct no-charge health education classes at community centers, churches, and senior centers, where messages are well received. NTAS has had considerable success with its "Walk for Life" program, a weekly low-impact walking program. Despite limited resources, this type of grass roots effort is making a substantial difference in diabetes awareness and bringing about behavioral changes. NTAS is well integrated into the community and is, therefore, able to understand and incorporate cultural values into designing interventions that are more effective for Pacific Islanders than broadscale, more costly, interventions.

No conflict of interest

P-1218

Successful and effective lay educators in diabetes - can a formal recruitment and selection process help you find them?

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Aims/objectives: To describe a formal recruitment and selection strategy for prospective lay educators (LEs) delivering structured diabetes education.
Methods: An action research study reporting in 2006, concluded that ad hoc recruitment was not effective for identifying individuals likely to make successful lay educators in diabetes. Building on its recommendations, a task group of the DESMOND Lay Educator Study developed a formal strategy for recruiting and selecting lay educators, based on procedures currently existing in the UK National Health Service. Advertising, recruitment, short listing, selection and appointment of lay educators took place over 12 weeks in the 6 Primary Care Trusts (PCTs) taking part in the study. In 2 PCTs with a significant ethnic minority population (Gujerati speaking in Leicester City, and Mirpuri Punjabi speaking in Peterborough), the recruitment process involved community workers and non-health agencies in order to contact hard to reach groups. Recruitment advertising used a variety of methods: nationally, awareness raising was conducted through the national patient organisation, Diabetes UK; locally, advertisements ran in pharmacies, GP practices, diabetes clinics, community centres, libraries, and local media.
Results: In total, 179 people expressed an interest in the lay educator role, of whom 108 were ineligible (e.g. incomplete contact data provided, living outside required geographical area). Out of 71 people receiving application packs, 29 returned these completed. Reasons for not making an application were generally linked to appreciation of the level of commitment required, and how this was prioritised against existing commitments. Of those completing an application: 72% were female; 41% were in the 45-59 age group; 38% had higher education qualifications; 66% described themselves as working, and 79% either had diabetes themselves, or had a family member with diabetes.
Conclusion: A formal recruitment strategy is a useful process in identifying high calibre candidates to be lay educators, and a positive tool for helping prospective applicants decide if the role is suited to them.

No conflict of interest

P-1219

Diabetes education in China - a systematic review of the literature

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Purpose: The purpose of this systematic review is to assess and summarize evidence and gaps in the literature regarding diabetes education in China.
Methods: Data sources:Chinese-language articles were searched for the terms Diabetes and Education, from Chongqing Weipu and Qinghua Tongfang database. English-language literatures were searched for terms Education, and China or Chinese from National Science and Technology Library (NSTL). The search was assisted by information professionals.
Articles selected were included in the review if the participants lived in mainland China and were diagnosed with diabetes; original articles; control trials; results from a diabetes education intervention to promote self management; HbA1c or behavior changes should be measured in the evaluation; and the articles had been published between 1989 and July 22nd 2008. Data extracted from the 33 studies found to be eligible. Relevant data on participants' demographics, interventions, outcomes and methodological quality were tabulated. Outcomes were classified as learning, behavior change, clinical improvement and increased health status and others. Studies were compared in terms of sample types and sizes, duration, and content and results of intervention.
Results: Among 3031articles (3031articles, 3018 in Chinese and 13 in English), 33 studies meet inclusion criteria. The participants were almost all from inpatient and outpatient department. The educators were physician, nurse, dietitian and psychologist, but only 13 studies conducted by a multidisciplinary team. The methods of diabetes education were very similar---Didactic teaching (class teaching or one to one teaching). Most studies selected knowledge and glycemic control as the outcome measurement, less than half studies reported behavior change. Positive effects of diabetes education on knowledge, and glycemic control were demonstrated in studies with short follow-up (3~6 months). Effects of interventions on behavior change, BMI, blood pressure, lipids, and medical cost were not clearly addressed; long-term outcomes and adherence to diabetes education was unknown because all the studies were of short duration.
Conclusions: Diabetes education had a great impact on glycemic control in China. Future studies on diabetes education should use more creative ways of diabetes education other than class teaching and one to one teaching; duration of follow up should last more than 1 year, and Long-term impact of diabetes education should be evaluated. More importantly, we have to evolve diabetes education from didactic teaching to more theoretically based empowerment models.

No conflict of interest

P-1220

Medical student perceptions and acceptance of a multidisciplinary diabetes elective

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Aims: To describe the development and student acceptance of a one-month rotation for fourth-year medical students that emphasizes diabetes as its major component.
Methods: The Diabetes and Endocrinology Senior Medicine rotation for fourth-year medical students at the University of South Carolina School of Medicine, Columbia, South Carolina, USA is structured as follows: 1) 4 half-days of outpatient work with an endocrinology faculty member, where the student sees patients in office practice and multifactorial therapy of diabetes is emphasized. The student is expected to develop a systematic diagnostic approach, physical examination, case presentation, and differential diagnosis skills 2) teaching

conferences (grand rounds, basic science and clinical conferences) 3) periodic review of relevant medical literature 4) diabetes and nutrition education classes at the Diabetes Education Program 5) pursue a clinical research project or write a brief review paper with preceptor guidance.
Results: 34 fourth-year medical students have completed the diabetes elective over a 52-month period. The student feedback and responses were evaluated by scores in different areas using the following scale: 1=poor, 2=borderline, 3=average, 4=good, 5=outstanding. The average overall score for the "effectiveness of the rotation for the teaching and practice of clinical medicine" was 4.7, for the "amount of knowledge gained and teaching provided" was 4.6, and for "improving diabetes management skills" was 4.9. In addition, all students wrote a project paper on a topic of their choice with recent references which helped to enhance their literature review and medical writing abilities.
Conclusions: A carefully-structured diabetes rotation for senior medical students is suitable and has a high level of acceptance. Devoting a month-long experience in developing expertise in diabetes, its complications like retinopathy, nephropathy, and neuropathy, and its co-morbidities like hypertension, dyslipidemia, and atherosclerotic disease can form a useful aspect of exposure to clinical medicine in medical school.

No conflict of interest

P-1221

A patient-to-patient support program: experiment for improving life among people living with diabetes

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The French Organization for Diabetes is a patients' association with 130 000 members created in 1938 and state-approved in 1976. French Organization for Diabetes acts to improve quality of life of people living with diabetes, or at risk of developing diabetes, with the help of its 125 local associations.
Its training program enables volunteers of its network to become « patient experts » in order for them to become true qualified expert patients and use their knowledge to help others. They strengthen their skills to listen and inform other patients, talk about their own experience, and help participants to improve their quality of life.
Since 2008, this training program is experimented in 8 French districts, as part of a larger program entitled "Stimulation for a better quality of life for people living with diabetes". 35 volunteers have been trained to specifically intervene and run local peer support activities.
Aims: The program aims at coaching and supporting people living with diabetes to improve quality of their life, using their own experience with the disease.
Description and methods: Based on sharing experiences between patients, this program offers opportunities to participate in free peer support groups carried out by the expert patients trained. Groups are open to anybody living with diabetes, family or friends' circles.

- Peer support groups : a collective and dynamic action allowing participants to talk and share about their life experiences.
- Face to face meetings: individual action which aims at helping someone to find their personal issues.

These meetings focus on participants' environment and personal life projects without intervening in the treatment. It allows patients to express their denials, fears, and questions, and to better accept their condition by managing their daily life.
Results:

- Between June and September 2008 :
  - 35 « Patient experts » volunteers have been trained and skilled to « group meetings management » and to « face to face meetings » methods.
- Between September and December 2008 :
  - 58 peer support groups were organized
  - 246 participants registered
  - 75% of participants confirmed they were in need of such meetings and exchanges with other patients living with diabetes.

Conclusion: By its program, the French Organization for Diabetes confirms the need for peer support activities provided by trained expert patients. The participation is increasing. AFD confims its willingness to respond to a need for coordination of all local experiments which are conducted by all health stakeholders working in diabetes educational and patient peer support.

No conflict of interest

Psychosocial / behavioural interventions

P-1222

Spirituality in young people with diabetes: can it be measured?

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Background: Spirituality is a coping resource that helps people with diabetes accept the diagnosis, undertake appropriate self-care and develop personally.
Aim: The aim of the study was to develop and validate a tool to assess spirituality in young people with diabetes, the spirituality questionnaire (SQ).
Methods: The original 35 item questionnaire was developed after a review of the literature and discussion with relevant experts. The validation processes used were: content validity, construct validity using factor analysis, test-retest reliability, and internal consistency using Cronbach's alpha correlation coefficient.
Two sample groups aged 18-28 consisting of males and females were recruited:

1. 160 non-diabetic young adults to undertake the factor analysis component.
2. 25 young adults with diabetes to examine test-retest reliability and internal consistency.

Results: After content validity was established three items were removed from the questionnaire. Exploratory Factor Analysis was undertaken on the remaining 32 items. The communalities ranged between 0.54-0.82. Kaiser-Meyer-Olkin (KMO). Sampling adequacy was 0.9 (n=160). After undertaking four-factor solution, three items with loading <0.5 were deleted. Loadings of the remaining items ranged between 0.50–0.84, leaving four factors and 29 items:

1. "Self-awareness" (10 items).
2. "The importance of spiritual beliefs" (4 items).
3. "Spiritual practices" (6 items).
4. "Spiritual needs" (9 items).

Mean Cronbach's Alpha was 0.94: range 0.80-0.91. Test-retest reliability using Wilcoxon matched-pairs test revealed no significant differences between the responses over 8-10 weeks.
Conclusions: The SQ is valid and reliable and measures key aspects of spirituality: inner self, meaning in life, connectedness, and transformation. Diabetic and non-diabetic perceptions of spirituality were similar.

No conflict of interest

P-1223

The effect of combined relax and music therapy on blood biochemical characters and blood pressure in patients with type 2 diabetes

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Introduction and objectives: The purpose of this semi-experimental study was to evaluate the effect of combined relax and music therapy on blood biochemical characters and blood pressure on the diabetic patients through 3 months.
Materials and methods: 100 patients with diabetes type 2, according to subjects' characters, were invited to participate if they agreed and were randomized into the intervention and control group. The intervention group was stratified into 10 groups with 5 patients in each group. The intervention programs were carried through 10 sessions (music therapy and relax therapy consist of progressive muscle and breathing relaxation, imagery) and home practice. Intervention duration was 3 months. Blood pressure, total Cholesterol, Triglyceride, HbA1c and FBS were measured before and after the study. All patients also filled out the questionnaire related to biography and some diabetes risk factors before and after the study.
Results: A total of 75 patients (intervention group=30 and control group=45) completed the 3-month study. The result showed that Serum TG levels were similar in both groups at baseline and after study. Although blood pressure, HbA1c and Cholesterol decreased in intervention group, there were no significant difference between two groups. FBS significantly decreased in intervention group compared to control group (p=0.018).
Conclusion: We suggest that combined relax and music therapy is a feasible and effective treatment on diabetes; therefore, adding relax and music therapy to other treatments such as physical activity and diet, in people with type 2 diabetes, can help them to control and manage their diabetes better.

No conflict of interest

P-1224

Evaluating the clinical skill in motivational interviewing in the treatment of type 2 diabetes

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Aim: To evaluate the clinical skill in the practice of motivational interviewing. This evaluation is a part of the implementation of a randomised control trial studying the effect of a 1 year self care behaviour intervention programme based on motivational interviewing in chronically ill patients with type 2 diabetes.
Motivational interviewing has proved effective in eliciting behaviour change in a broad range of behavioural problems and diseases. Further research is needed to establish knowledge about how motivational interviewing education of health care providers is performed and how the method is used in client counselling.
Method: This evaluation included training of health care provider, supervision, videotaping and evaluation by Motivational Interviewing Treatment Integrity (MITI) Coding System. The evaluation method was used to provide a comprehensive examination of interviewer behaviours and to yield feedback that can be used to increase clinical skill in the practice of motivational interviewing. In the MITI evaluation a random 20-minute segment from videotaped interviews from each health care provider practicing motivational interviewing was assessed to be used in the MITI coding. The training and supervision was carried out by a MI-trainer from the Motivational Interviewing Network of Trainers in Nordic countries.
Result: Prior to the intervention programme 2 diabetes specialist nurses, 1 dietician and 1 physiotherapist were educated in motivational interviewing. The course content 5 days' theoretical introduction to strategies in motivational interviewing, and critical dimensions of motivational interviewing: empathy and the motivational interviewing spirit. The course was followed by 3 practical coaching sessions every 3rd month for 24 months. After the 5 days course the health care providers were individually supervised by the MI-trainer in 10 real patient situations in a period of 18 month. For each health care provider performing motivational interviewing 5 sessions were videotaped in a period of 36 months. In the MITI coding the global interviewers ratings were 4-5 point given on a 5 point Likert scale. The behaviour counts showed that open questions and complex reflection were used.
Discussion: This evaluation demonstrates high competency in using motivational interviewing among the health care providers in a self care behaviour intervention programme in patient with type 2 diabetes. MITI is proposed to be used in the feedback process as a way for health care providers to improve their use of motivational interviewing in clinical practice. This research imply the importance of close supervision of the health care provider performing motivational interviewing since conducting motivational interviewing involve a high dependence on individual agents and individual expertise.

No conflict of interest

P-1225

Is depression a serious problem among hospitalized patients with diabetes mellitus?

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Introduction: Diabetes mellitus (DM) is a chronic disease which affects patients' mental health. Comorbid depression has a significant impact on metabolic control, quality of life and mortality among patients with DM.
Aims: The aim of the study was to assess prevalence of depression symptoms in population of individuals with diagnosed DM hospitalized in inpatient ward, and to display relation between occurrence of depression symptoms and lifestyle, applied treatment and presence of DM chronic complications.
Methods: Into the study were included 80 patients (40 females, med. age – 58,3 ± 13,9 years) with diagnosed DM hospitalized in Department of Gastroenterology and Metabolic Diseases Medical University of Warsaw. Exclusion criteria were diagnosed malignant, systemic or neurodegenerative diseases. Control group was created by 56 patients (28 females, med. age – 49,1 ± 16,8 years) of Department without diagnosed DM. Obtained, using Beck Depression Inventory, frequencies of depression symptoms among both groups of patients were compared. Next were analyzed selected components of lifestyle, duration of DM, treatment scheme and presence of DM chronic complications among patients with and without depression symptoms.
Results: No important difference in prevalence of depression symptoms between studied and control group was found (77,5% vs 73,2%; p>0,05). Among patients with DM more often were observed symptoms of severe depression (7,5% vs 1,8%) but it was not significant (p>0,05). There were found significant positive correlation between presence of depression symptoms and low motion activity (32,3% vs 5,6%), lack of active interests (56,5% vs 11,1%), low education level and presence of diabetic foot ulcer (22,6% vs 0%).
Conclusions: Symptoms of depression occur in about 3 of 4 hospitalized individuals, proving the problem's generality. Among patients with DM it is particularly important to focus on recognizing severe depression. Symptoms of depression more often occur among patients with diabetic foot ulcer and showing lower life activity.

No conflict of interest

P-1226

Phone call as an intervention for improving walking practice in type 2 diabetes

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Aims: The aims of this study were to investigate the impact of phone call support as a tool for promoting daily physical activity during a period of six weeks in a group of type 2 diabetes patients with poor glycemic control (A_{1C} ≥8%).
Methods: A randomized controlled trial enrolling 48 type 2 diabetic patients with poor glycemic control (HbA_{1C} Hg ≥8%) was conducted at an Internal Medicine ambulatory from January 2008 to October 2008. The intervention patients received phone calls, during six weeks, in order to improve walking activity. Control patients received only one telephone call. The number of steps was recorded every week using pedometers. The outcome was the variation of the number of steps between the first and sixth week of the intervention. Information about clinical, metabolic and demographic data, socio-economic status, personality profile, quality of life and depression symptoms were obtained. All patients were analyzed based on their original assignments as an intention-to-treat analysis.
Results: There were no differences at the baseline values of all clinical, socio-demographic and anthropometric aspects between the two groups as well as for the other possible interfering variables that may modify the response for the stimuli of improving walking activity. The phone call support showed an efficacy of 90%. The relative risk reduction was 75% and it was necessary to give a phone call support for three patients in order to obtain an increment in the number of the steps between the sixth and the first week of the study (NNT=3.0).
Discussion/conclusions: In order to reduce the health impact of type 2 diabetes it is required to focus on optimization of the treatment of these patients and in the primary prevention targets related to improving physical activity. Walking is the most popular leisure time activity. However, these patients naturally walk at a speed that is slower than that associated with minimal intensity required to obtain health benefits. In the present study we showed that the phone call support was an efficient intervention for promoting walking activity during six weeks in type 2 diabetic patients with poor glycemic control.

No conflict of interest

P-1227

The effect of diabetes and its control on susceptibility to learned helplessness in streptozotocin-induced diabetes rats

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Aims: In order to examine the mechanism linking diabetes to depression, specifically whether diabetic rats in good glycemic control versus those in hyperglycemia, or subject to exposed alternative periods of hyper and hypoglycemia, are different at risk of affective disorder. We induced learned

helplessness, as model of depression, is indicated the rate of cognitive processing.
Methods: Using the streptzotocin rats receiving insulin NPH or saline, totally 37 rats, were divided into 4 types of glycemic control groups, Group A (good), B (hypo-hyper), C (untreated), D (controls).
The bodyweight, the blood glucose concentration and HbA1c were measured. And all animals were placed in a learned helplessness paradigm,
Forced swimming test (FST): the scorer would rate the rat's behavior each 5 second period, as one of the following four behaviors: immobility and another action. We examined the differences in the length of immobility (a key marker of learned helplessness) with the analysis using Tukey-Kramer multiple comparison.
Results: Glycemic control: Group A had nearly kept smaller change of blood glucose throughout the day. Group B blood glucose showed a very steep fall from 475.8 ± 193.2 (mean ± SD) mg/dl to 42.8 ± 22.6 mg/dl within three hours after the insulin injection. Mean HbA1c of the diabetic group without insulin treatment significantly increased from 5.9 ± 1.3 to 8.7 ± 4.0 % ($p < 0.0001$). In diabetic groups receiving insulin injection once a day or twice a day, the level of HbA1c significantly decreased from 5.6 ± 1.0 to 3.8 ± 0.6 % and 6.4 ± 1.7 to 3.7 ± 0.5 % respectively. There was no difference in the levels of HbA1c before treatment and after treatment between the groups with one daily injection and two daily injection of insulin.
The bodyweight in A and B groups was not significantly different compared with that in non diabetic control group ($P = 0.001, 0.001$). Group C is significantly low compared with that in Group D (< 0.0001).
FST: There were trends for counts of immobility to be higher in all 3 diabetic groups compared to Group D, especially in Group B, the mean count of immobility is significantly high compared with Group D (< 0.001). There is no significant difference between 4 groups in the mean counts of swimming. The climbing was significantly low in Group C compared to Group D (< 0.001).
Conclusion: The rats which had been exposed to hypoglycemia and hyperglycemia are more likely to develop learned helplessness than good glycemic control rats. These investigations are thought to be interesting to examine the relationship between diabetes and depression, and suggested that acute changes in glycemic control could be the mechanism of susceptibility to affective disorder.

No conflict of interest

P-1228

Psychonutritional intervention to improve the level of information, life quality, treatment adherence, self-efficacy and family support in patients with type 2 diabetes

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The type 2 diabetes is the main reason of morbi - mortality in the world and particulary in Mexico. The treatment is based on changes in the way of life, this is difficult to achieve in the majority of cases, which is reflected in the therapeutic adherence and in a negative impact in the quality of treatment in general. The support both of the family and of the multidisciplinary health team is fundamental to achieve the control of the disease.
Aims: Determining the effectiveness of the psychonutritional intervention to improve the level of information, the quality of life, the adherence treatment, self-efficacy and the family support, in people with type 2 diabetes and their relatives.
Methods: In this study the subjects of study were recruited in a voluntary way, the only one requirement was that they were present at health center of Actopan and Tizayuca, Hidalgo. It was shaped for 22 persons and it was divided in 2 groups, in the first group the people with type 2 diabetes and their relatives received a psychoeducate intervention - conductual, and the group 2 received the traditional medical treatment.
The instruments were applied: Questionnaire of Information, questionnaire of Quality of Life (DQOL), the Questionnaire of self-efficacy for Diabetics. The Family APGAR and the Instrument to evaluate Family Support in type 2 diabetes. The adherence to the treatment was evaluated indirectly with the evaluation of glycated haemoblobin, the Body Mass Index (BMI) and levels of blood glucose.
Results: The analysis results showed the psychonutritional intervention is effective when we evaluated other variables, for example the level of information in group 2 changed from 6 to 10 points after the intervention, the same situation occured in the type 2 diabetes relatives changed from 6.5 to 9.5 points. The glycated haemoglobin levels decreased until 6.4% after the intervention.
Discussion/conclusion: the psychonutritional intervention in type 2 diabetes patients influence in the treatment and control of disease.

No conflict of interest

FOUNDATION SCIENCE

Genetics of type 1 diabetes

P-1229

Association analysis of HLA-DRB1 in type 1 diabetes Romanian families

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Background and Aim: Type 1 diabetes (T1DM) is a chronic autoimmune disease conditioned by multiple genetic and environmental factors. The major diabetes genes reported so far belong to the class II MHC region, DQB1 and DRB1 loci. For both these two loci, diabetogenic and protective alleles were described. Our aim was to assess the effect of some HLA-DRB1 alleles on T1DM risk in the Romanian population, one with the lowest reported incidence of T1DM in Europe.
Materials and methods: The study group comprised 1,515 individuals with 439 T1D patients (206 male/224 female) and 1,076 unaffected first degree relatives. On this study group, comprehensive typing of HLA/DRB1 alleles was performed. Genotyping was done by PCR-SSOP. Data were analysed using the Transmission Disequilibrium Test (TDT) using Stata® 8.1 (http://www.stata.com/). Subsequently, primary data were analyzed by conditional logistic regression using the high resolution HLA-DQB1 genotypes for the entire study group.
Results: We previously reported a strong diabetogenic effect for both DRB1*03 and DRB1*04, as for all Caucasian populations. We found a significant decreased transmission to diabetics for HLA-DRB1*07 (25.3% transmission, $p_{TDT} = 6.5x10^{-7}$), DRB1*10 (20% transmission, $p_{TDT} = 0.003$), DRB1*11 (20.15% transmission, $p_{TDT} = 4.81 \times 10^{-12}$), DRB1*12 (5.56% transmission, $p_{TDT} = 0.0002$), DRB1*13 (25.29% transmission, $p_{TDT} = 4.03 \times 10^{-6}$), DRB1*14 (10.26% transmission, $p_{TDT} = 6.91\% \times 10^{-7}$) and DRB1*15 (10.81% transmission, $p_{TDT} = 1.56\% \times 10^{-11}$), suggesting their protective nature. The transmission of the same alleles to unaffected siblings was not significantly different from 50%. Overall the effect of HLA-DRB1 was strongly significant, with a $p = 3.72x10^{-46}$. This effect was reduced (but remained significant) after conditional logistic regression analysis (taking into account the current HLA-DQB1 genotypes) with $p = 9.12x10^{-8}$. After this analysis, DRB1*07 (RR of 0.04), DRB1*12 (RR of 0.03) and DRB1*15 (RR of 0.08) retained an independent protective effect.
Discussion/conclusion: Our results indicate a strong diabetogenic effect of DRB1*03 and DRB1*04 and a possible protective effect of HLA-DRB1*07, HLA-DRB1*12, and HLA-DRB1*15 alleles for T1DM appearance in the Romanian population. We also showed that the effect is independent from the influence of known protective HLA-DQB1 alleles. However, the analysis of a much larger family study group from the Romanian population is required before drawing a final conclusion.

No conflict of interest

P-1230

The role of cytokine gene polymorphism, HLA typing and beta-cell autoimmunity in the risk of celiac disease in children with type 1 diabetes mellitus

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Background: Some genetic polymorphisms and immunological associations may significantly modify the risk of celiac disease (CD) in subjects with type 1 diabetes mellitus (T1DM).
Aims: The aim of the study was to evaluate genetic predisposition in class II HLA and by gene polymorphism of TNF-a, IFN-γ, IL-6, IL-10, as well as to investigate relationship between the risk of celiac disease and ß-cell associated antibodies.
Material and methods: After screening in 33 children T1DM with a positive tTG antibodies. histopathology, HLA genes DR, DQ, cytokine polymorphisms and antibodies: IAA, IA2A, GADA were analyzed. The group with celiac disease and T1DM (CDM) was compared to the groups with only: T1DM (DM), CD (C) and healthy controls (K)
Results: Silent CD in 24 (72.72%) and a latent form in 9 (27.27%) cases was diagnosed. The onset of T1DM was 6.41± 3.27 years. CD occurred after 1,28± 1,34 year of T1DM duration. The haplotype DRB1*03 DQB1*02 was presented in 25 children (75.76%), significantly more frequent than in the group DM (p=0,01) and was related to the risk of CD, OR=3,54 (1,28-9,81). GADA (84,84%) were found in the CDM-group more often than IA2A (69.69%) and IAA (57.57%) or GADA in the CD-group (66.67%). Positive statistical significance in genotype in TNF-a was also observed between group CDM and DM (p=0,02). The multiple regression model for risk of CD in children with T1DM prove great importance of genotype TNF-A role in this process (OR=6.67, p=0.004).
Conclusions: The risk of CD in children with T1DM is modified significantly by a variant of allele TNF-a – 308A and presence of haplotype DRB1*03 DQB1*02. Due to their population linkage, it is not possible to determine which of these two is of greater significance. Presence of antibodies GADA seem to be an important factor for the development of CD.

No conflict of interest

P-1231

Thyroid and coeliac autoimmunity in first degree relatives of type 1 diabetic patients

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In Cuba, the worldwide proved presence of extrapancreatic autoimmunity in first degree relatives (FDR) of type 1 diabetic patients has not been established yet. Frequencies of silent or subclinical autoimmune thyroiditis (AT) and coeliac disease (CD) among that population remain unknown. However their significance for health is not negligible.
Aims: To determine the frequencies of positive thyroid peroxidase autoantibody (AbTPO) and tissue transglutaminase antibody (AbtTG) among FDR of type 1 diabetic patients in the National Institute of Endocrinology. Also to set up a possible association between their confirmed thyroid and coeliac autoantibodies with previusly non-detected clinical features and with presented glutamic acid decarboxylase-65 (GAD65) and tyrosine phosphatase insulinoma antigen-2 (IA-2) autoantibodies.
Methods: A descriptive, prospective research was developed over a sufficiently large sample of 570 FDR: ages between 2 and 65 years and absence of chronic illness requiring immunosuppressive drugs. A questionnaire was applied seeking for gastrointestinal symptoms and/or thyroid dysfunction. Clinical exam and serum lab tests were performed: AbTPO measured by RIA; AbtTG detected by immunochromatographic assay; GAD65 and IA-2, measured by IRMA. Descriptive statistical analysis was made.
Results: Frequency of AbTPO amoung FDR was 6.15% and AbtTG expressed positive in 3.3% of these subjects. There was no association between found AbTPO and AbtTG with positive pancreatic GAD and IA-2 antibodies. Undetected tachycardia and goiter were significantly associated with positive AbTPO FDR group. No clinical manifestation of CD could be linked with positive AbtTG. Relatives with thyroid autoimmunity were advised for follow-up. Those with positive AbtTG were submitted to intestinal biopsy.
Conclusion: Serological screening amoung FDR may be useful for early detection of CD, which has an accurate treatment in gluten free diet. AT is detectable even before impairment of hormonal function starts. These findings suggested that the screening for thyroid and other organ-specific diseases-related autoantibodies, in type 1 diabetes close relatives, may ensure useful information about the probable clinical course of those entities.

No conflict of interest

P-1232

The effect of HLA-B on type 1 diabetes genetic susceptibility in Romania

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Background and aim: Type 1 diabetes (T1DM) is a chronic autoimmune disease determined both by genetic and environmental factors. The major diabetes genes currently reported are HLA DQB1 and DRB1 from the class II MHC region. Meanwhile, there is data for an independent effect of some class I HLA A and B alleles. In order to assess the potential independent role of HLA-B on T1DM risk in Romania (country with one of the lowest reported incidences of T1DM in Europe), we performed a high resolution HLA-B typing in 423 nuclear families.
Methods: The study group comprised 1,515 individuals with 439 T1DM patients (206 male/224 female) and 1,076 unaffected first degree relatives. Genotyping was done by PCR-SSOP. Data were analysed using the Transmission Disequilibrium Test (TDT) using Stata® 8.1 (http://www.stata.com). Subsequently, primary HLA-B data were analysed by conditional logistic regression using the high resolution HLA-DQB1 and -DRB1 genotypes for the entire study group.
Results: Primary data showed increased transmission to diabetics of HLA-B*08 (71.3% transmission, $p_{TDT} = 6.5 \times 10^{-7}$), B*15 (69.2% transmission, $p_{TDT} = 0.005$), B*41 (74.1% transmission, $p_{TDT} = 0.0002$), and B*50 (85.7% transmission, $p_{TDT} = 0.00002$) and decreased transmission for B*52 (25.8% transmission, $p_{TDT} = 0.007$). The transmission of the same alleles to unaffected siblings was not significantly different from the expected 50%. Overall the effect of HLA-B was significant with a $p = 7.42 \times 10^{-13}$. However, the conditional logistic regression analysis (taking into account the current HLA-DQB1 and -DRB1 genotypes) did not support an independent effect for the HLA-B locus, the significance being reduced to $p = 0.1928$. After this analysis, the only alleles that retained a degree of independent effect were B*50 with a RR of 2.25 and B*58 with a RR of 4.80. With a RR of only 1.33, we could not confirm the association with B*39, reported for other Caucasian populations.
Discussion/conclusion: We were unable to evidence an independent effect of the HLA-B locus in a large dataset of Romanian T1DM families. However, it is still possible that such an effect exists and could be detected using a much larger Romanian T1DM family cohort.

No conflict of interest

P-1233

Association of HLA-DRB1/DQB1 alleles and haplotypes with susceptibility to type 1 diabetes among Tunisians

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Aims: HLA class II genes contribute to the genetic susceptibility of type 1 diabetes (T1D), and both susceptible and protective alleles and haplotypes were implicated with its pathogenesis. This study investigated the heterogeneity in HLA class II haplotypes distribution among Tunisian T1D patients.
Methods: Subjects comprised 88 T1D patients and 112 healthy controls. HLA DBR1 and DQB1 genotyping was done by PCR-SSP.

Results: Significant DRB1 and DQB1allelic differences were seen between T1D patients and controls, which comprised DRB1*030101 and DQB1*0302 which were higher, and DRB1*070101, DRB1*110101, DQB1*030101, and DQB1*060101 which were lower in patients than in control subjects. In addition, the frequencies of DRB1*030101-DQB1*0201, and DRB1*040101-DQB1*0302, and those of DRB1*070101-DQB1*0201 and DRB1*110101-DQB1*030101 haplotypes were lower in T1D patients than control subjects. Logistic regression analysis revealed the positive association of DRB1*030101-DQB1*0201, and DRB1*040101-DQB1*0302, and the negative association of only DRB1*070101-DQB1*0201 haplotypes with T1D. Furthermore, significantly increased prevalence of DRB1*030101-DQB1*0201 homozygotes and heterozygotes, as well as DRB1*040101-DQB1*0302 homozygotes were seen in T1D subjects than in control subjects.
Conclusion: Our results confirm the association of specific HLA-DR and –DQ alleles and haplotypes with T1D, with similar and unique haplotypes identified that distinguish Tunisians from other Caucasians. These findings highlight the need for evaluation of the contribution of HLA class II to the genetic susceptibility to T1D with regard to specific HLA haplotypes, and also to the ethnic origin and racial background.

No conflict of interest

P-1234

Case-control study of polymorphism of CTLA4 +49 A/G gene in type 1 diabetes in Tunisia

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Type 1 diabetes (T1D) is a complex autoimmune disease. Several genetic loci have been implicated in the susceptibility to this illness. Evaluated was the role of the CTLA4 exon 1 A49G polymorphism and its role as a risk factor for T1D in our population. DNA from 120 patients with T1D and 96 control individuals were genotyped for CTLA4 exon 1 polymorphism by polymerase chain reaction (PCR) amplification–restriction enzyme analysis and PCR amplification that used sequence-specific primers, respectively. Patients were nonobese and < 26 years old. The CTLA4 G allele was found to be more frequently present in patients with T1D (36.4%) as compared with its frequency in control individuals (18.5%). The GG genotype was also significantly higher among patients (17.6%) than in controls (7.2%). X^2 analysis and family-based association studies were performed and suggested the association of CTLA4 exon 1 G polymorphism with T1D ($p = 0.02$). This study suggests that CTLA4 is a candidate susceptibility gene for T1D.

No conflict of interest

Genetics of type 2 diabetes

P-1235

Mutations detected in HNF-1a gene in students with diabetes mellitus inheritance by means of the PCR-DGGE-Multiplex method

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Maturity-Onset diabetes of the Young (MODY) is a monogenic variant of Diabetes Mellitus, this disease is characterized by an autosomal dominant inheritance. It has an early beginning and defect in insulin secretion. The aim was to investigate the frequency of diabetes MODY 3 among the university student population with family diabetes mellitus inheritance, using the PCR-Multiplex-DGGE technique for the diagnosis. We searched the database of the Clinical Analysis Laboratory of the DACS from 2001-2005 and selected 108 young university students between 18 and 35 years old who had some glucose or triglycerides abnormalities in their lab test entrance to medical schoo,l and those who had inheritance of diabetes mellitus type 2 in two or more family generations. The metabolic characteristics were analyzed in young students with mutations and without them. The 15.74% showed alterations in glucose metabolism and 3.70% was diagnosed as DM 2. It was observed that 32.40% of the students presented insulin resistance (HOMA). We did the primers design about the sequence of the HNF-1a gene taken from GenBank (www.ncbi.nlm.nih.gov), and we added a CG clamp of 60 mer to assure the visualizations of the mutations through the DGGE. We implemented a PCR-Multiplex-DGGE-HNAF-1a to amplify exon2, exon3-4 and exon7, which allowed determining that 3.70% of the young university students that were included in this study had some kind of mutations in the exons. Although there are general characteristics of diabetes type MODY 3 we couldn't define a clinically specific mutations, suggesting that the clinical features of each individual depends on the type of mutation and the location of these domains in the gene.

Table. Clinical and metabolic features in student with mutations

Features	Exon2	Exon3-4	Exon7	Exon7
Gender f/m	M	F	F	M
Years old	20	19	22	21
Bmi	28	19	22	21
Glucose (mg/dl)	94	84	90	88
Homa	1.8	0.8	5.6	1.5
Cholesterol (mg/dl)	202	153	139	185
Triglycerides (mg/dl)	92	54	239	348
C-hdl (mg/dl)	47	51	75	52
C-ldl (mg/dl)	136	91	18	63

No conflict of interest

P-1236

Peroxisome proliferator-activated receptor-gamma coactivator-1a gene Thr394Thr G/A polymorphism and its relationship to type 2 diabetes and insulin resistance in a Chinese population

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Aims: to examine the relationship of the Thr394Thr polymorphism of PGC-1a gene to type 2 Diabetes in a Chinese population.
Methods: 307 subjects were enrolled in this study including 151 type 2 diabetic patients and 156 normal glucose tolerant controls (NC). The Thr394Thr polymorphism was genotyped using polymerase chain reaction-restriction fragment length polymorphism (PCR-RFLP). Concentrations of glucose, insulin, lipids were determined in all subjects. BMI, waist circumferences, HOMA-IR and blood pressure were also measured.
Results: 43% of type 2 diabetic patients (66/151) had the AG Thr394Thr genotype compared with 37% in NC group (58/156). The frequency of the A allele of the Thr394Thr polymorphism was 22% in type 2 diabetic patients compared with 18% in NC subjects. There were no significant differences either in genotype or allelic distribution of Thr394Thr polymorphism between the type 2 diabetes and the NC group. Diabetic subjects had higher levels of BMI, waist circumferences, blood systolic pressure, triglycerides and lower levels of HDL-C compared with the control subjects ($P<0.05$). In diabetic patients, subjects with XA genotypes had significantly higher levels of waist circumferences ($p<0.05$) and lower levels of HDL-C ($p<0.05$) than those of patients carrying GG genotype.
Conclusion: The A allele of Thr394Thr (G to A) polymorphism of the PGC-1a gene may not be associated with type 2 diabetes in Chinese population. But we found that type 2 diabetic patients with XA genotypes had significantly higher levels of waist circumferences and lower levels of HDL-C.

No conflict of interest

P-1237

Association between polymorphisms in uncoupling proteins and type 2 diabetes in a northwestern population from Colombia

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Introduction: The uncoupling proteins belong to the family of anion transporting proteins, which uncouple the ATP production from the

mitochondrial respiration causing proton leakage through the inner mitochondrial membrane and releasing energy as heat. Although its function has not been well established, some polymorphisms in these proteins have been associated with type 2 diabetes mellitus, obesity and insulin resistance.
Objective: To assess the association between the polymorphisms –3826A/G, ID 45, -2723T/A, -1957G/A, -866G/A, -55C/T in uncoupling protein 1, 2 and 3 genes and type 2 diabetes mellitus in a north-western Colombian population.
Materials and methods: 545 cases and 449 controls were genotyped for 14 polymorphisms in uncoupling protein genes by PCR and PCR-RFLP. Single associations were evaluated by chi-square test and bayesian logistic regression analysis was done including as covariates the individual admixture estimates obtained by 54 informative markers for European, African and Amerind ancestry.
Results: Association between type 2 diabetes mellitus and the polymorphisms -3826A (OR=0,78; CI 95%=0,63-0,97; p=0,02) and -55C (OR=1,41; CI 95%=1,04-1,92; p =0,03) and the haplotype D45, -866G, -1957G, -2723T, -55C (OR=1,26; CI 95%=1,02-1,56; p=0,03) were found. These associations were kept after the adjustment using individual genetic admixture estimates.
Conclusion: Some alleles of uncoupling protein genes 1, 2 and 3, and their haplotypes confer risk of type 2 diabetes in a north-western Colombian population.

No conflict of interest

P-1238

Identification of variants in genes candidates of resistance to insulin in Antioquian population

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Objective: To identify a molecular marker of risk for Type 2 Diabetes (T2D) in genes implied in the physiopathology of the obesity and resistance to insulin in a sample of Antioquian population, to be used in early diagnosis of susceptibility to Diabetes type 2.
Methodology: In a group of patients with T2D and control group, using the techniques PCR-RFLP (28 variants in 10 genes) and SNPlex (48 variants in 33 genes and 6 chromosomic regions), evaluated polymorphic variants in genes that take part in differentiation of the adipocyte, lipogenolysis, lipogenesis, secretion and signaling of insulin and regulation of the synthesis of ATP in mitochondria; and positive results of association in genomic sweepings in patients with DM2. In order to eliminate the slant in the results by stratification by mixture, 75 informative markers of ancestry were genotyped, to calculate the degree of triethnic mixture of each individual.
Results: 72 variants in 43 genes in an average of 830 cases and 400 controls were genotyped. Were significant differences in age, weight, index of body mass, measures of waist and hip, in the index waist-hip, and sex. Of the total of analyzed variants, 10 were monomorphics. In the 62 rest, when doing the correction by mixture, was association with diabetes mellitus 2 to 18 variants with 12 genes (PKN2, RBMS1, CALP 10, ADIPOQ, LEP, CDKN2B, TCF7L2, EXT2 UCP 2 and 3, IRS2 and FTO), a region in the chromosome 10 and another one in chromosome 11. Also was association to the index waist hip to 6 variants in 5 genes (RBMS1, SCLC2A2, ENPP1, TCF7L2 and UCP2), when the measurement of body mass index was evaluated I observed no signal.
Conclusions: We manage to identify a group of haplotypes that have demonstrated a P and a significant OR (average 0,01 and 1,02, respectively) in genes CALP 10, ADIPOQ, CDKAL2, LEP, TCF7L2, EXT2, UCP 2 and 3 and FTO. At the moment we are in the stage to calculate the effect of each one of the variants and the haplotypes that showed association to DM2 and the index of waist and hip, under a quantitative model.

No conflict of interest

P-1239

Serum adiponectin levels and adiponectin gene ploymorphisms in Tunisian patients with type 2 diabetes

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Aims: Low levels of adiponectin, resulting from genetic and / or environmental factors, have been associated to insulin resistance, type 2 diabetes and cardiovascular diseases. Recent evidence also suggested that some polymorphisms (SNPs) of adiponectin are associated to type 2 diabetes and metabolic syndrome and may modify adiponectin concentration and / or activity. Our aim was to assess adiponectin concentrations in Tunisian type 2 diabetic patients and to examine the associations between T45G and G276T SNPs of adiponectin gene, type 2 diabetes and its degenerative complications.
Methods: This case-control study included 302 Tunisian patients with at least a 10-year history of type 2 diabetes and 216 gender-, BMI-, district of residence- matched controls. In addition to anthropometric data and medical history derived from a personal interview, serum leptin, C-peptide and insulin were determined using IRMA method. All diabetic and control subjects were genotyped for T45G and G276T SNPs using PCR – RFLP.
Result: Adiponectin levels were significantly lower in diabetic patients compared to controls (11.27 ± 4.00 vs 16.1 ± 5.90 µg/ml; $p < 0.001$). Adiponectin levels were inversely correlated to age (OR : -0.219 ; $p<0.001$), BMI (OR: -0.271 ; $p < 0.001$) and waist circumference (OR : -0.206 ; p : 0.02) in both groups. Other negative correlation was also found between adiponectin levels and triglyceride concentrations (OR: - 0.257 ; $p < 0.001$) and between adiponectin levels and HOMA-IR in diabetic patients although not statistically significant. We have not found any association between adiponectin levels and the occurrence of diabetic microangiopathy after controlling for potential confounding factors (age, gender, BMI). There was no difference in frequency of T45G and G276T genotypes between patients and controls. Microangiopathy (retinopathy and/or nephropathy) seemed to be associated to G276T SNP with a seven-fold risk of the occurrence of these complications in TT or GT patients compared with GG patients. The presence of T allele was also associated to a 3-fold increase in the occurrence of coronary disease.
Conclusion: In line with previous studies, this work supports the role of low levels of adiponectin in type 2 diabetes and metabolic disorders. We did not found any association between type 2 diabetes and both studied genotypes. However, the T allele of 276 SNP seems to play a role in the occurrence of microvascular and macrovascular diabetic complications. Further studies are necessary to highlight the role of adiponectin in the prevention of these complications.

No conflict of interest

P-1240

Familial and genetic investigation of type 2 diabetes in Tunisia

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Aim: To evaluate the degree of familial aggregation and transmission patterns of type 2 diabetes (T2D) in Tunisia and to investigate whether the ACE (I/D) polymorphism is associated with T2D.
Methods: Family history of diabetes was collected for 206 unrelated type 2 diabetic patients. The medical records were taken for diabetes status in first (parents, siblings) and second degree relatives (aunts and uncles from both maternal and paternal sides). The maternal effect was first tested among parents (mother vs father) and then among aunts and uncles (maternal vs paternal). Comparison of proportions was performed by X^2 test (McNemar). Blood samples were also taken to conduct a case-control study investigating

the involvement of (I/D) polymorphism in the susceptibility to T2D. One hundred forty one unrelated type 2 diabetics and 103 non diabetic controls with normal fasting blood glucose were explored. Genotyping of the I/D polymorphism within ACE gene was performed by nested PCR.

Results and discussion: Data collected for Family study demonstrated that familial aggregation of T2D was prominent: 78% reported at least one diabetic relative. The studied subjects reported more positive history of the disease in their mother than in their father (29% vs 9%). This maternal effect is confirmed in older generations. The genotype distributions and allele frequencies of the (I/D) polymorphism did not significantly differ between T2D subjects and non diabetic controls with normal fasting blood glucose (DD:43%, ID: 46%, II: 11% vs DD:37%, ID: 48%, II: 15%, respectively), (X^2=1.42, p value=0.49).

Conclusion: The present study suggests a strong familial aggregation and excess maternal transmission of T2D. Moreover, our study shows that ACE (I/D) polymorphism is not associated with a higher risk of T2D in the Tunisian studied population.

No conflict of interest

P-1241

Adiponectin gene polymorphism and type 2 diabetes mellitus in Ukrainian population

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Studies of association between adiponectin gene polymorphisms and predisposition to type 2 diabetes mellitus (T2D) have provided contradictory results. The aim of the present study was to search for association of +276G>T single nucleotide polymorphism (SNP) in the adiponectin gene (APM1) with T2D and its related metabolic traits in Ukrainian Caucasians.

Methods: The study groups comprised 115 unrelated T2D patients (M/F 44/71, age 55.7±1.1 yrs, diabetes duration 7.8±0.7 yrs, BMI 32.5±0.7 kg/m^2, HbA_{1C} 8.1±0.2%) and 103 controls (C) without T2D and metabolic syndrome (M/F 62/41, age 55.3±2.1 yrs). +276G>T SNP in APM1 was detected using the restriction fragment length polymorphism technique. ELISA was used to determine plasma adiponectin levels.

Results: In T2Ds allele frequencies for the +276G>T SNP were 0.50 for both G and T allele, and they did not differ significantly from C (G 0.45; T 0.55). No gender difference was observed in allele frequencies in both studied groups. But genotype distributions were different between two groups: it was shown a significant departure from Hardy-Weinberg equilibrium in C (X^2=31.02, p<0.001) and correspondence to it in T2Ds (X^2=2.11, p>0.05). In comparison with C, T2Ds had more homozygotes (GG: 28.8 vs 6.8%, p<0.01; TT: 28.7 vs 16.5%, p<0.05). Relative risk for T2D development in population was for GG 4.23 [95% CI 3.45 – 5.01], p<0.001, and for TT 1.74 [95% CI 1.20 – 2.28], p<0.05; subjects with GT genotype had a significantly lower risk of having T2D: 0.57 [95% CI 0.33 – 0.81], p<0.001. Interestingly, the degree of the increase in serum triglycerides and NEFA levels (metabolic parameters of insulin resistance) was significantly smaller in T2Ds with GT genotype than in those with other genotypes. The T2Ds genotype groups were well matched for age, diabetes duration, BMI, fasting glycaemia and HbA_{1C} levels.

Conclusions: Our findings demonstrate for the first time the potential protective role of GT genotype of adiponectin gene +276G>T SNP for type 2 diabetes development in Ukrainian population.

No conflict of interest

P-1242

Comparison of patterns of type 2 DM between native Pakistani and UK immigrant South Asians

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Objective: This study was designed to assess whether the pattern of diabetes in native South Asians is different from immigrant South Asians.

Materials and methods: Data on Pakistan based South Asians was collected through non-probability purposive sampling of 100 type 2 diabetics attending out-patient clinic of The Aga Khan University Hospital at Karachi, Pakistan for a cross sectional survey. This data was compared with data from UK based South Asians acquired through a study carried out at Ealing Hospital, London enrolling 889 UK immigrant South Asians.

Results: The age of the native Pakistani diabetic male patients attending clinic at AKUH was significantly less than the UK based south Asian men attending clinic at Ealing hospital (p=0.006). When considering the pattern of disease, presentation and the duration of diabetes, no difference was found. In addition, the age of diagnosis of type 2 DM was also found to be similar. The range of BMI was similar between the two groups of south Asian. Further risk factors such as smoking were significantly more common among Pakistani male patients when compared to their UK counterparts. (26.7% vs. 12%, p=0.010) and predictably this difference was not observed among female patients. Although the prevalence of HTN was found to be more among the Pakistani female patients when compared to UK female diabetics (69.1% vs. 39%,p=0.001), a difference not observed among the male patients. When looking at the degree of control of diabetes among patients, the values for HBA1C were found to be significantly lower among Pakistani male diabetic patients when compared to UK south Asian diabetics (8.7 vs.11.3, p=<0.001 for men & 8.2 vs. 11.9, p=<0.001 for women). The prevalence of IHD was similar between both groups, which have been shown to be higher in south Asians when compared to Europeans in previous studies. Retinopathy prevalence was higher, and significantly so among men, in UK South Asians compared to Pakistani patients, (29% vs.13.3%, p=0.037) although the difference was not significant among female patients.

Conclusion: In conclusion, it appears that besides environmental factors, genetic influence appears to be significant influencing the pattern and mode of presentation of type 2 diabetes among South Asians and it should be a focus of future research.

No conflict of interest

P-1243

PC-1 gene polymorphism and type 2 diabetes mellitus

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Introduction: Polymorphism of PC-1 (Plasma Cell glycoprotein-1) result either in the overproduction or overactivity of the glycoprotein, which leads to less response to insulin as it has an inhibitory effect on insulin receptor (IR) and is associated with clinical insulin resistance.

The normal genotype is (KK) while the abnormal could either be homozygous (QQ) or heterozygous (KQ). In each case, lysine (K) is substituted by glutamine (Q). Studies in transfected cells has shown that polymorphism of this gene leads to stronger inhibition of IR; and this occurs due to increased physical interaction between the two proteins at the cell membrane leading to increased insulin resistance.

The objective of this study is to find the relation between polymorphism of PC-1 gene and type 2 DM.

Materials and methods: the study group consists of 50 type 2 diabetic patients and 50 non-diabetic control. DNA was extracted from white blood cells by salting-out method first, then PCR for amplification of specific nucleotide sequence is done. Gel electrophoresis for detection is the final step.

Results: interesting preliminary results show that, the carriers of KQ or QQ genotypes of PC-1 gene polymorphism were more prevalent among type 2 diabetic patients compared with non-diabetic control. Sample size is not yet complete to put final statistics and planned to be completed within 3 months time.

Conclusion: preliminary results show that the carriers of KQ or QQ genotypes of PC-1 gene polymorphism are at a higher risk of developing DM-2. Final conclusion is to be made after completion of the sample evaluation and statistical assessment.

No conflict of interest

Insulin action - carbohydrate, lipid and protein metabolism

P-1244

Role of resveratrol in gluconeogenic genes expression in the liver

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Background and aim: Resveratrol (RSV), a naturally occurring polyphenol found in grape and red wine, is known as an activator of silent information regulator 2 (Sir2) which is a NAD^+-dependent histone deacetylase. Recently, it has reported that expression of hepatic gluconeogenic genes, phosphoenolpyruvate carboxykinase (PEPCK) and glucose-6-phosphatase (G6Pase), inhibited by insulin signaling was restored by RSV. However a molecular mechanism of the restoration is not well yet established.
The forkhead transcription factor (FOXO1) is known as a transcriptional activator of genes involved in the gluconeogenesis. In the presence of insulin, FOXO1 is phosphorylated and exported from nucleus to cytosol, losing its ability to activate gene transcription.
In this study, we demonstrated that RSV up-regulates the expression of gluconeogenic gene through deacetylation of FOXO1 by activating SIRT1.
Materials and methods: mRNA level for gluconeogenic genes was measured in primary cultured hepatocytes of rat and mouse by real-time PCR. In the presence of insulin, the effect of activator or inhibitor of SIRT1 was studied using Western-blot analysis using primary cultured hepatocytes. Also its effect was identified by observing the localization of FOXO1 and SIRT1 in Alexander cell lines by using immunofluorescence microscopy. The binding of FoxO1 to the promoter regions of gluconeogenic genes are tested by chromatin immunoprecipitation (CHIP) assay using primary cultured hepatocytes.
Results: Down-regulation of gluconeogenic gene by insulin was reversed by RSV in a dose-dependent manner and its effect was counteracted by Sirtinol. In the presence of insulin, PI3K/AKT and ERK 1/2 pathway was affected by activator or inhibitor of SIRT1. RSV induced the localization of FOXO1 to nucleus by deacetylation causing up-regulation of gluconeogenic genes. CHIP assay showed that nuclear FOXO1 directly binds to the promoter region of gluconeogenic genes causing increase in the mRNA level of gluconeogenic genes.
Conclusion: SIRT1 is known to deacetylate the FOXO1 through direct interaction. In this study, we showed that deacetylation of FOXO1 may decrease the insulin-induced phosphorylation of FOXO1, causing nuclear translocation and as a result, up-regulation of gluconeogenic genes. This observation may help explain how RSV increases gluconeogenic gene expression which is suppressed by insulin.

No conflict of interest

P-1245

Expression of myostatin in obese and insulin resistant rats subjected to exercise

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Aims: The objective of this study was to determine the influence of exercise in the expression of myostatin (MSTN) in fat and muscle in rats with obesity and insulin resistance induced by high-fat (HF) diet.
Methods: Adult male Wistar rats were housed under controlled conditions (20-22^0 C, 10-14h light-dark cycle) and were allowed free access to standard rodent chow (control group, CG) or HF diet (58% Kcal from fat, high-fat group, HG) during 12 weeks. Glucose tolerance test (GTT) and insulin tolerance test (ITT) were performed before and at 3, 4, 8 and 12 weeks. After 12 weeks, CG and HG rats were randomly assigned to a swimming training group (CGE and HGE) or a sedentary group (CGS and HGS). CGE and HGE swam individually in water tanks (50x30cm) at 34^0 C, for 45 minutes at 0900h and 1700h, 5 day week^{-1}, for 4 weeks. After this period, rats were submitted again to GTT and ITT and then killed by decapitation. GTT area under the curve was lower in HGE compared to HGS. White gastrocnemius muscle and fat pads were dissected, weighed, immediately cooled in liquid nitrogen and stored at -70^0 C for subsequent analysis. MSTN mRNA was quantified by real time RT-PCR. The animals were maintained according to the local University Committee guidelines for the care and use of laboratory animals.
Results: HG developed insulin resistance according to GTT and ITT tests. Adipose fat pads (epididymal, retropritoneal and mesenteric) were 2-3 times heavier in high-fat fed groups (HGS and HGE) compared to standard chow fed groups (CGS and CGE). In HGS rats, MSTN mRNA levels were significantly ($P<0.05$) higher (~2 times) in mesenteric fat compared to CGS rats. However MSTN mRNA levels were significantly lower in epididymal and brown adipose tissue (BAT) in HGS compared to CGS. Swimming training resulted in a significant reduction of MSTN mRNA levels in gastrocnemius in CGE compared to CGS. However, MSTN mRNA levels were significantly increased in BAT in both CGE compared to CGS. In high-fat fed groups, swimming training did not alter MSTN expression in muscle. However, MSTN mRNA levels significantly decrease in mesenteric and increase in epididymal and BAT.
Conclusion: These data suggest that the expression of MSTN in fat tissues may be involved in metabolic response of high-fat fed rats to exercise.

No conflict of interest

P-1246

Acute hyperglycemia affects serum adiponectin concentrations and the endothelium-dependent dilation in subjects with impaired glucose tolerance and in newly diagnosed diabetic patients

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Aims: Adiponectin is an adipokine with beneficial effect on vascular function. Although adiponectin levels are decreased in patients with diabetes mellitus (DM), it is unclear whether impaired glucose tolerance (IGT) affects adiponectin's release, or whether glucose intake modifies its release from adipocytes. We examined the effect of glucose loading on serum adiponectin and insulin levels, and we evaluated its impact on endothelial function. We also compared these effects between subjects with IGT, patients with DM and healthy individuals.
Methods: The study population consisted of 113 subjects: 19 with IGT, 78 patients with DM and 16 controls. All subjects underwent glucose loading (75g oral glucose), and blood samples were obtained at baseline and after 3 hours. Endothelial function was evaluated by gauge-strain plethysmography at baseline and every 1h, and endothelium-dependent dilation (EDD) was determined. Adiponectin and insulin levels were measured at baseline and at 3h.
Results: Glucose loading increased adiponectin levels in healthy (7.01±0.85 to 8.08±1.14 ng/ml, $p<0.05$) and IGT (5.26±0.45 to 6.13±0.65 ng/ml $p<0.05$) but not in DM (5.59±0.35 to 5.68±0.35 ng/ml) individuals. Although insulin was correlated with adiponectin both at baseline ($r=-0.375$, $p=0.0001$) and at 3h ($r=-0.286$, $p=0.006$), insulin variations did not follow the same pattern (healthy: 6.55±0.65 to 9.25±1.17 IU/L $p<0.05$, IGT: 11.6±2.7 to 17.6±4.9IU/L $p<0.05$, and DM: 10.24±0.89 to 20.99±2.37 IU/L $p<0.0001$). There was no association between the changes of insulin and those of adiponectin (p=NS). EDD was decreased after loading in healthy (from 76.6±5.2% to 63.0±6.6%, 57.0±6.5% and 89.3±6.3% at 0h, 1h, 2h and 3h respectively, $p<0.05$ for 0h vs 2h), in IGT (from 92.8±6.4% to 66.9±6.1%, 68.6±6.8% and 85.6±6.1% at 0h, 1h, 2h and 3h respectively, $p<0.01$ for 0h vs 2h) and DM (from 86.1±5.1% to 60.7±2.4%, 54.6±2.3% and 75.2±2.8% at 0h, 1h, 2h and 3h respectively, $p<0.01$ for 0h vs 1h, 2h and $p<0.05$ vs 3h).
Discussion/conclusions: Glucose intake increases adiponectin levels in healthy individuals and subjects with IGT, but not in those with DM. This effect is independent of insulin variations. On the contrary, endothelial function was impaired after glucose intake, an effect which is more profound in patients with diabetes mellitus. These findings provide new insights into the associations between insulin, adiponectin and endothelial function in diabetes mellitus.

No conflict of interest

P-1247

Paradoxical behavior of free fatty acid during OGTT in patients with type 2 diabetes and secondary failure to oral antidiabetic medications

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Aims: The aim of this study was to investigate the changes of FFA during an OGTT in patients with type 2 diabetes (DM) and secondary failure to oral antidiabetic medications in comparison to healthy controls and to explore possible correlations with insulin resistance.

Methods: We studied 30 patients with DM and 30 control subjects (C). All subjects underwent an OGTT with 75g glucose. Blood was drawn at baseline and at 30, 60, and 120 min after the ingestion of glucose. Plasma glucose, insulin and FFA were measured. Areas (AUC) under glucose, insulin and FFA curves were calculated. Various indices of insulin resistance, and insulin secretion were calculated as well i.e.: the homeostasis model assessment of insulin resistance index (HOMA-IR), the insulin resistance indices by Belfiore (IRIGLY and IRIFFA) and the insulinogenic index at 30 min. The rate of FFA decrease (K-value) from 30 to 120 minutes was calculated as percent per minute.

Results: At baseline FFA and fasting glucose were higher in diabetics compared to controls: 39.9vs13.3mg/dl and 179.8vs93.0mg/dl $p<0.001$ respectively, while fasting insulin was lower: 8.9vs12.9mU/l $p<0.01$. Fasting FFA were positively correlated with insulin resistance indices in both groups ie: DM: HOMA $r=0.42$ $p<0.01$, IRIGLY $r=0.44$ $p<0.05$, IRIFFA $r=0.82$ $p<0.001$. Controls: HOMA $r=0.54$ $p<0.01$, IRIGLY $r=0.38$ $p<0.05$, IRIFFA $r=0.85$ $p<0.001$. During OGTT, in diabetics, FFA increased at 30 min above baseline by 97.6% and afterwards gradually decreased up to 120 min: 0′= 39.9, 30′= 57.9, 60′=36.3, 120′= 26.3mg/dl. On the contrary in controls a gradual decrease was observed: 0′= 13.3, 30′= 9.9, 60′= 6, 120= 4.1 mg/dl. In diabetics the change of FFA at 30 min was not related to either insulin resistance or insulin sensitivity indices, while in controls it was positively related to insulin resistance indices (HOMA $r=0.44$ $p=0.01$, IRIGLY $r=0.43$ $p=0.01$). Insulin AUC 30-120 min was significantly lower in DM compared to Controls: 466.1 vs 3883.4 mg/dl*min, $p<0.001$. From 30 to 120 min both in diabetics and in controls the FFA decreased constantly. The rate of decrease from 30 to 120min showed no correlation with insulin resistance and did not differ between the two groups: K-value 0.097 vs 0.098, although, the area under the insulin curve, during this time period, was statistical significantly greater in controls than in diabetics.

Conclusions: During the first 30 min of the OGTT, a paradoxical transient increase of FFA in patients with type 2 diabetes and secondary failure to oral antidiabetic medications has been detected. This phenomenon does not seem to be related to insulin resistance and can not be easily explained.

No conflict of interest

Insulin action - glucose transport, receptors, cellular mechanisms

P-1248

Insulin alone or in association with captopril: effects on signal transduction pathways and cardiac function after ischemia-reperfusion

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Introduction: Although insulin attenuates cardiac ischemia-reperfusion injury via activation of cell-survival and metabolic pathways, its association with the inhibition of the renin-angiotensin system has not yet been evaluated.

Aim: To evaluate the effects of insulin and captopril on insulin/angiotensin signal transduction pathways and cardiac function in the isolated heart submitted to ischemia-reperfusion.

Methods and results: Male Wistar rats (n=84, ~320g) were killed (cervical displacement), hearts quickly removed and perfused according to the Langendorff technique (10ml/min), with Krebs-Henseleit (KH) for 25min (baseline). Global ischemia was induced (20min), followed by reperfusion (30min). During reperfusion different solutions were employed: Krebs-Henseleit (KH), KH + insulin (I), KH + angiotensin-I (A), KH + insulin + angiotensin-I (IA), KH + angiotensin-I + captopril (AC) and KH + insulin + angiotensin-I + captopril (IAC). Lipoperoxidation (TBA-RS and chemiluminescence), antioxidant enzyme activities (SOD, GST and catalase), nitrates and $_{cu/zn}$SOD, GST, $_{e}$NOS, $_{phospho}$AKT, $_{phospho}$AMPK and GLUT-4 (immunoblotting) were measured. During recovery, the A group showed a 24% reduction in developed pressure and an increase (~2.7-fold) in end-diastolic pressure vs baseline, effects that were reverted in the AC, IA and IAC groups, and a 24% reduction in rate-pressure product vs baseline, an effect that was reverted by insulin. The perfusion pressure was ~20% higher in all groups (except I) vs KH group. The $_{phospho}$AKT was higher in the I and IA groups vs KH (~47% and ~42%, respectively) and A (~60% and ~55%, respectively) groups. The $_{phospho}$AMPK was ~31% higher in the I, IA and IAC groups vs KH, A and AC groups. The TBA-RS levels were ~73% higher in KH vs other groups; the chemiluminescence was also higher (~2,2 fold) in the KH group vs other groups, and ~35% lower in the IA vs A group. SOD activity was similar between groups, but catalase activity was ~28% higher in the KH vs other groups (except IA, P=0,058). GST activity was higher in A and AC (~45% and ~50%, respectively) vs I. The A, AC and IAC groups showed a lower concentration of $_{cu/zn}$SOD (~40%, ~43% and ~27%, respectively) vs KH. There were no changes in GST and $_{e}$NOS enzyme concentrations, GLUT-4 translocation index and total nitrate levels.

Conclusions: During ischemic heart reperfusion, insulin activates the PI3k-AKT pathway, improves the redox balance, activates AMPK and inhibits the deleterious effects of angiotensin-II actions, changes that were translated into improved cardiac function. These effects were more pronounced with insulin alone than when associated with captopril.

No conflict of interest

P-1249

Signalling transduction mechanism of BRL37344 and clenbuterol-stimulated glucose uptake in mouse isolated soleus muscle

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Introduction: In mouse soleus muscle, we have reported that very low concentrations (10 or 100 pM) of BRL37344 and the selective β_2-adrenoceptor

agonist clenbuterol stimulated glucose uptake. Higher concentrations (100nM) of clenbuterol inhibited glucose uptake, but BRL37344 (10nM) displayed a second, more pronounced stimulatory effect. Studies using selective antagonists, suggested that the effects of 10nM BRL37344 and 100nM clenbuterol were mediated through the β_2-adrenoceptor.
Glucose uptake was inhibited by 100nM clenbuterol, and stimulated by 10μM BRL37344 suggesting these agonists affect different signalling mechanisms via the β_2-adrenoceptor. We have already reported that the effect of 10pM clenbuterol increased cAMP levels and 100nM effect decreased cAMP levels, whereas there were no cAMP changes associated with the effect of low and high concentrations of BRL-37344 (Ngala et al., 2008 Br J Pharmacol. Oct; 155 (3): 395–406)
Aim: To investigate the intracellular signalling mechanism associated with the effect of BRL-37344 and clenbuterol on glucose uptake in soleus muscle.
Methods: Isolated soleus muscles from male C57Bl/6 mice were preincubated for 60 min in Krebs-Henseleit bicarbonate (KHB) buffer. 2-deoxy [1-^{14}C] glucose (0.1 μCi/ml) uptake was measured over 45 min in KHB buffer that contained 5.5mM glucose and 0.1nM bovine insulin. Muscles were then digested in 0.5ml 1M NaOH, neutralised with HCl, and 2-deoxyglucose-6-phosphate was precipitated using 1ml of 1:1 2.68% Ba $(OH)_2$: 2.51% $ZnSO_4$. The incubation medium contained various concentrations of the beta-adrenoceptor agonists in the presence or absence of either 1 μM.wortmannin, 1μM LY294002 (PI3K inhibitors), 1 μM compound C (AMP activated protein kinase inhibitor), 20 μM PD98059 (prevents activation of MAPKKinase, 10 μM SB203580 (p38MAPK inhibitor) or 10μM H89 (protein kinase A inhibitor).
Results are means ± S.E. values
Summary: The effect of 10pM clenbuterol was blocked by wortmannin and LY294002 whereas BRL37344 were blocked by wortmannin only. SB203580 (10 mM) blocked the effects of 10pM clenbuterol and 100nM BRL37344. 20 mM PD98059 had no effect on any of the concentrations of agonists. Also, only 10pM clenbuterol was blocked by compound C.
The protein kinase A inhibitor prevented the stimulatory effect of 10 pM clenbuterol on glucose uptake and also inhibited the stimulatory effects of 10 pM and 10 nM BRL-37344 on glucose uptake.
Conclusion:
1. Clenbuterol-stimulated glucose uptake is cAMP dependent and involves the activation of PI3K and p38 MAPKinase.
2. The stimulation at 10pM is AMPKinase dependent.
3. BRL-37344 stimulation may be cAMP dependent. The effect was blocked by H89

BRL37344-stimulated glucose uptake mediated through the activation of PI3K and p38 MAPKinase

No conflict of interest

P-1250

Regulation of DGAT1 gene expression by XBP1 in hepatocyte

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Aims: Acyl-CoA:diacylglycerol acyltransferase 1 (DGAT1) is one of two known DGAT enzymes that catalyze the final step of triacylglycerol synthesis. Mice lacking DGAT1 have increased insulin sensitivity and energy expenditure and are resistant to diet-induced hepatic steatosis. However, little is known about the regulatory mechanisms controlling DGAT1 gene transcription. This study aimed to investigate the effect of X-box binding protein 1 (XBP1), a key regulator of the unfolded protein response, on transcriptional regulation of mouse DGAT1 gene in hepatocyte.
Methods: Transcriptional activity of mouse DGAT1 promoter by XBP1 was measured by luciferase assay in a human hepatoma cell line (HepG2). In vitro translated XBP1 protein was used in electrophoretic mobility shift assay (EMSA) to show the binding of XBP1 in mouse DGAT1 promoter.
Results: We have localized and characterized XBP 1 binding site in the promoter region of mouse DGAT1 gene. Ectopic expression of XBP1s, an active spliced XBP1, in HepG2 cells activated the promoter activity of DGAT1 gene. Serial deletion/mutation studies localized the XBP1 binding site to a region between bases -293 and -287 of the DGAT1 promoter. The XBP1 binding site in this region was confirmed by EMSA.
Conclusion: These results suggest that XBP1 activates the gene expression of DGAT1 by direct binding on DGAT1 promoter.

P-1251

The key role of PTP1B in the TNFa-induced leptin and insulin resistance in hypothalamus of rats

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Obesity is accompanied by resistance to insulin and leptin, however the molecular mechanisms underlying these resistances in obesity are not completely understood. PTP1B is a major negative regulator of insulin and leptin sensitivity, acting to dephosphorylate the insulin receptor and the leptin receptor-associated Janus kinase 2. Factors that cause or accompany development of insulin and leptin resistance are attractive potential mediators of PTP1B overexpression in obesity. Evidences indicate that obesity is an inflammatory state, with an increase in pro-inflammatory cytokines. Subclinical inflammation may have an important role in the development of insulin and leptin resistance, however, the role of inflammatory mediators in the regulation of PTP1B in the hypothalamus has not yet been investigated. One factor that plays a role in the development of insulin resistance is the tumor necrosis factor alpha (TNFa). TNFa is a pleiotropic cytokine which occurs in many pathological processes, including inflammation. Recent studies have confirmed an important role of TNFa in the pathogenesis of insulin resistance and obesity in human and in animal models. However its mechanism of action is not fully understood. In the present study, we have associated functional and molecular studies of insulin and leptin to investigate the effect of TNFa on central insulin and leptin signaling in rats pre-treated with PTP1B-ASO (PTP1B antisense oligonucleotide). Cannulated icv rats were treated with PTP1B-ASO for 4 days. At the end of the fourth day, rats were treated icv with insulin, leptin, TNF-a, saline or with combinations of TNF-a with insulin or leptin. Our results showed that central administration of TNFa increases PTP1B protein and activity, together with reductions in insulin and leptin sensitivity and signaling in hypothalamus, suggesting that PTP1B should be included in the group of inflammatory responsive genes. At least in part, this resistance to leptin and insulin depends on the capacity of TNF-a to stimulate PTP1B expression and activity in the hypothalamus, because PTP1B-ASO improves the effect of leptin and insulin on food intake and signaling, with increased activation of IR, IRS1, JAK2, STAT3 and AKT. Therefore, we suggest that PTP1B plays a key role in TNFa-induced insulin and leptin reduced sensitivity and signaling, since hypothalamic PTP1B deficiency ameliorates TNFa-induced leptin and insulin resistance.

No conflict of interest

P-1252

Influence of gastric emptying on transport of food and orally administered glucose

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Aim: To develop a simulation mathematical model for identification of influences of gastric emptying process on absorption and/or elimination of food and orally administered glucose in healthy subjects.
Methods: Modeling tools from the linear dynamic system theory and concentration data from measurement over 24 hours meal after a normal diet and from a frequently sampled oral glucose tolerance test (FSOGTT) [1] were used.
Results: The developed model was capable of: 1) determining time profiles of glucose and food retained in the stomach, and 2) simulating influences of gastric emptying rate on glucose and/or food on plasma glucose and insulin concentration-time profiles in all subjects enrolled.
Conclusion: The presented model is theoretically sound, sensitive, and reproducible. It may contribute to the working library of the modeling techniques in diabetes research, since it allows accounting for influences of the gastric-emptying process on absorption and/or elimination of food and on glucose and insulin plasma concentration-time profiles in FSOGTT. It may be one of the important keys to achieve glucose control in diabetes.

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No conflict of interest

P-1253

High carbohydrate or high fat meals decrease insulin sensitivity two hours after the ingestion

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Aims: Insulin resistance results from a combination of genetic and environmental factors and may be considered the primary cause for the development of metabolic disorders, such as diabetes mellitus. It is characterized by a reduced ability of the insulin sensitive tissues to respond to normal levels of the hormone. In these tissues, glucose transport stimulated by insulin occurs through the glucose transporter (GLUT4) and alterations in its expression are related to changes in insulin sensitivity. This study evaluated the acute effect of a high carbohydrate meal and a high fat meal on the insulin sensitivity and on the content and distribution of GLUT4 protein (plasma membrane and microsomal-enriched fractions) in the gastrocnemius skeletal muscle and periepididymal white adipose tissue.
Methods: Male Wistar rats fasted for 24 hours, were refed for 1, 2, 4 or 6 hours with one of the three meals: balanced meal (B-group, refed with standard meal); high carbohydrate meal (C-group, refed with toast) and high fat meal (F-group, refed with lard).
Results: Both C and F-groups exhibited insulin resistance after 2 hours of refeeding (Glucose/insulin index lower than B-group). In the insulin tolerance test (ITT), a reduction (~47%) in the insulin sensitivity was observed in C group after 2 and 4 hours of refeeding. In the glucose tolerance test, performed 2 hours after the beginning of ingestion, the relation between the area under the curve of plasmatic insulin and the area under the curve of plasmatic glucose confirmed the insulin resistance in C and F-groups. Although high carbohydrate and fat meals reduced insulin sensitivity, they did not alter GLUT4 protein subcellular distribution.
Conclusion: These results suggest that imbalanced meals with high carbohydrate or fat concentration lead to reduced insulin sensitivity after 2 hours of ingestion and such phenomenon does not involve alteration in GLUT4 content in muscle and adipose tissues.

No conflict of interest

P-1254

Impaired GLUT4 expression in oxidative muscle affects the glycaemia in SHR diabetic rats

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Aims: The SLC2A4 gene encodes the GLUT4 protein which is highly expressed in muscular and adipose tissues. In these tissues, glucose uptake is elevated when energy substrate is abundantly available, as in the postprandial state, when insulin levels increase, triggering the translocation of GLUT4 protein to the plasma membrane. Alterations in this gene are correlated with increased or decreased insulin sensitivity. The hypertension associated with diabetes can change the GLUT4 expression. The present study was aimed at investigating the participation of the treatment with insulin or propranolol (ß-adrenergic antagonist) or insulin+propranolol in the regulation of GLUT4 gene expression in soleus muscles and periepididymal white adipose tissue of diabetic normotensive Wistar rats and spontaneously hypertensive rats (SHR).
Methods: Normotensive (Wistar) and hypertensive (SHR) rats with 1 month of diabetes were treated or not with insulin and/or propranolol during 7 days. GLUT4 expression was analyzed by Northern and Western Blotting.
Results: Before treatment, all animals were over 100mg/dl glycosuria, confirming their diabetes. The diabetic rats with insulin treatment increased the body weight and plasma NEFA levels, and decreased glycosuria. Glycemia decreased with insulin treatment in normotensive rats, but did not change in hypertensive rats. Propranolol treatment decreased systolic pressure in SHR rats. In adipose tissue and soleus muscle, insulin treatment increased GLUT4 mRNA in both Wistar and SHR rats, and insulin+propranolol treatment further increased GLUT4 mRNA in SHR rats. Preliminary data show that in soleus muscle GLUT4 protein content varies in accordance with mRNA changes in normotensive rats. However, in hypertensive rats insulin did not change the GLUT4 protein content. On the other hand, when combined with propranolol, insulin treatment seemed to improve the GLUT4 gene expression in SHR diabetics rats.
Conclusion: The improved GLUT4 expression in adipose tissue of insulin treated rats was not enough to decrease glycemia in the hypertensive rats. Moreover, hypertensive rats which were unable to increase GLUT4 protein expression in soleus in response to insulin, could not decrease their glycemia after treatment. These data suggest the hyperglycemia in hypertensive rats is related to impaired insulin-stimulated GLUT4 increase in oxidative muscle fibers.

No conflict of interest

P-1255

Effect of insulin therapy on glucose homeostasis of insulinopenic diabetic rats: contributions of insulin dose, GLUT4 expression and liver insulin signalling

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Aim: Insulin resistance involves reduced peripheral glucose uptake and/or increased hepatic glucose output. Hyperinsulinemic states have been associated to insulin resistance. Considering that peripheral hyperinsulinemia is observed in insulin-treated type 1 diabetic subjects, we hypothesize that the treatment might induce insulin resistance thus compromising the therapeutic benefits. The present study investigated in diabetic rats the effect of different doses of insulin on insulin sensitivity, as well as potential involved molecular mechanisms.
Methods: Three month-old rats were rendered diabetic by injection of alloxan (38 mg/Kg). Two weeks later they were submitted to treatment with saline (DS) or NPH insulin in different daily doses 1.5U ($I_{1.5}$), 3U (I_3), 6U (I_6) and 9U (I_9), for 7 days. Non diabetic rats (ND) were studied as a control group. After the treatments we analyzed: a) whole body insulin sensitivity, by analyzing basal glycemia and glucose disappearance rate (kITT) during in insulin tolerance test (ITT); b) GLUT4 protein in plasma membrane (PM) and microsome fractions of epididymal adipose tissue and gastrocnemius skeletal muscle; d) insulin signaling in liver.
Results: I_3-, I_6- and I_9-treated rats increased body and adipose tissue weights ($P<0.01$ vs. DS). The higher doses of insulin (6U and 9U) decreased basal glycemia to ~70% ($P<0.01$) of the DS values, restoring levels of ND rats. However, the kITT value remained lower ($P<0.05$) than the value of ND rats, indicating the presence of the insulin resistant condition. On the other hand, the dose of 3U did not normalize glycemia, but increased kITT value by ~250% ($P<0.001$ vs DS), achieving values higher than the observed in ND ($P<0.01$). Insulin treatments (3U, 6U and 9U) similarly increased the GLUT4 protein (~200%, $P<0.01$) in adipose tissue, which may be related to the similar tissue weight gain. Differently, in skeletal muscle the dose of 3U increased GLUT4 protein by ~20%, as compared to effect of 6U and 9U. Additionally, in liver of I_3-treated rats, increased basal values of phosphorylated- (p)-IRb (~100%, $p<0.01$), p-Akt Ser (~35%, $p<0.05$) and IRS2/PI3-kinase association (~45%, $p<0.05$) were observed, as compared to 6U and 9U.
Discussion/Conclusion: The present study shows that intermediary dose of insulin (3U) improve insulin sensitivity in diabetic rats, and that involves increased GLUT4 protein expression in muscle and enhanced insulin sensitivity in liver. However, this dose of insulin (3U) was not enough to normalize glycemia. On the other hand, tight glycemic control was achieved by using high doses of insulin (6U and 9U), but with these treatments, insulin resistance was observed, probably related to decreased muscle GLUT4 expression and liver insulin sensitivity.

No conflict of interest

P-1256

Regulation of GLUT4 expression in skeletal muscle cells by resistin

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Aim: Resistin is a potential link between obesity and insulin resistance or type 2 diabetes. However, there has been little investigation of the effects of resistin on glucose transporters regulation in skeletal muscle, a key tissue for glucose disposal. The aim of this study was to investigate the effects of resistin on regulation of GLUT4 expression in skeletal muscle cells in different conditions.
Methods: Rat myoblasts (L6) were cultured and differentiated into myotubes followed by stimulation with single commercial resistin (50ng/mL, 24 h) in the presence or absence of palmitate (500µm), hyperglycemic (25mM) or insulin-stimulated (100nM) conditions. GLUT4 protein content was assessed by Western blotting as well as GLUT4 mRNA was assessed by real time PCR.
Results: Treatment of L6 rat skeletal muscle cells with recombinant resistin reduced GLUT4 protein levels (30%) and increased GLUT4 mRNA (59%) only in the presence of palmitate. In the others conditions, skeletal muscle cells have not shown any alteration in GLUT4 expression.
Conclusion: In summary, GLUT4 transcription and translation were altered by resistin in L6 rat muscle cells only in the presence of palmitate.

No conflict of interest

P-1257

Effect of some active compounds of Morus alba leaf on glucose uptake and glucose transporter 4 in isolated diabetic rat adipocytes

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Aims: To study the effect of four active compounds of Morus alba leaf on glucose uptake and glucose transporter 4 (GLUT4) translocation in fat cells of diabetic rats.
Methods: Male Sprague-Dawley rats (weighing 200-250 g) were induced diabetic rat by a single intraperitoneal (i.p.) injection of STZ (45 mg/kg body weight). After 6 weeks STZ injection, diabetic rats were sacrificed and isolated the epididymal fat pads. Adipocytes were treated with four active compounds (caffeic acid, gallic acid, kaempferol and quercetin) of Morus alba leaf at concentrations of 0.1-100 mM or insulin 1.5 nM. After 30 minutes incubation, adipose cells were determined the glucose uptake and isolated cell fractionation for GLUT 4 translocation by Western blot analysis.
Results: Caffeic acid (1-100 mM) significantly increased glucose uptake into adipocytes by 23±6, 28±8 and 42±7 % of control, respectively. Kaempferol at the same concentrations of caffeic acid, increased glucose uptake significantly by 36±9, 64±10 and 24± 11 % of control, respectively. In the insulin treated adipose cells, the glucose uptake was also significantly higher than that of control glucose uptake by 65±6 %. These results have been associated to improve GLUT 4 translocation affected to increase glucose storage in adipose tissue.
Conclusions: Caffeic acid and kaempferol were found to stimulate the glucose uptake by increasing the translocation of GLUT4 in diabetic rat adipose tissue. These results may, in part, explain the ability of Morus alba leaf in controlling the hyperglycemia in diabetic patients.

No conflict of interest

P-1258

The thyroid hormone (TH) acutely increases the stability of the glucose transporter GLUT4 mRNA in 3T3-L1 cells

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Thyroid hormone (TH) effects on metabolism, growth, and development depend on its interaction with thyroid hormone receptors present on specific regions of its target genes, by means of which it can inhibit or activate gene transcription. However, some TH actions occur in a short period of time and in the presence of drugs that block gene transcription, as actinomycin D. These actions indicate that, in addition to its well-characterized genomic actions, TH also acts at the posttranscriptional level, by mechanisms that are not completely understood yet. One of the genes that are induced by TH is the one that codifies the GLUT4 protein, the main glucose transporter of the skeletal, cardiac muscle and adipose tissue, which is known to exert important effects on the glucose homeostasis maintenance. While, the genomic actions of the thyroid hormone on GLUT4 gene have been well characterized, there are no evidences about non genomic actions of T3 on GLUT4 expression.
Objective: To evaluate, in 3T3-L1 cells (adipocytes), the effect of the acute exposure (30 min) to T3 on the GLUT4 mRNA content and poly-A tail length, as well as on GLUT4 protein expression, in the presence or absence of previous blockade of the gene transcription, by actinomycin D.
Material and Methods: 3T3-L1 cells were treated under specific conditions until they differentiate into adipocytes. Part of them was kept in T3-depleted medium (TX) for 24 h, after which T3 (10^{-9} M) or vehicle was added, for 30 min. Part of the cells received actinomycin D (2 µg/ml) 1 h before the addition of T3. Control group consisted of cells cultured without any intervention. It was evaluated: the GLUT4 mRNA and protein expression, by real time PCR and western blotting, respectively, and the GLUT4 mRNA poly A tail length, by RT-PCR.
Results: The cells kept in T3-depleted medium (TX) presented a decreased GLUT4 mRNA and protein expression vs control group. T3 addition led to a rapid increase in both parameters, as well as on GLUT4 mRNA poly-A tail length, effects that persisted even in the presence of actinomycin D.
Conclusion: In parallel to its genomic actions, T3 can also act nongenomically increasing GLUT4 mRNA and protein expression. Considering that the stability and the translation efficiency of the transcript are directly related with the poly-A tail length, we can assume that the increased GLUT4 mRNA and protein expression were due to a T3 posttranscriptional action on GLUT4 mRNA polyadenylation step.
Support: Fapesp

No conflict of interest

P-1259

Cigarette smoke impaired GLUT4 expression in oxidative skeletal muscle

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There is evidence that smoke is related to a decrease in glucose transporters (GLUT4) expression and that exercise can increase the rate of transcription and GLUT4 expression in plasma membrane. This study aimed to quantify the expression of GLUT4 in oxidative skeletal muscle from rats subjected to cigarette smoke and physical exercise on a treadmill. Male Wistar rats were divided in groups: (S) sedentary, (E) submitted to aerobic exercise, (SS) smoker and sedentary, (ES) submitted to aerobic exercise and smoker. The groups SS and ES were subjected to combustion of 4 cigarettes for 30 minutes, twice a day for 60 days. E and ES performed the exercise protocol on a treadmill, 60 minutes a day, under same intensity for 60 days. Quantification of GLUT4 protein was performed by Western Blotting – ECL, after samples preparation with separation in plasma membrane (PM) and microsome (M) fractions. The quantification of GLUT4 mRNA was made by RT-PCR. For data analysis it was used descriptive statistical method and ANOVA test, results are presented as mean ± SEM. Differences among groups were considered significant when $P<0.05$. There was no alteration in body weight (BW) and glycemia (GL) among groups (BW: S:364.7±9.7; E:372.4±7.2; SS:368.9±6.8; ES:376.4±7.8 Kg; and GL: S:148±10, E:131.5±7.05, SS:139.5±9.7; ES:130.6±10.2 mg/dL, n=15 to 19 rats). The results of GLUT4 total protein content in PM fraction showed that cigarette smoke caused reduction compared to S group (S: 112.2 ± 9.5, E: 104.7 ± 13.48; SS: 65.4 ± 9.7 *; ES: 92.05 ± 15.9 expressed as AU, n = 10, * $P<0.05$ vs S). In M fraction, there was an increase in GLUT4 protein only in E group compared to S (S:157.7±20.7, E:287.7±54.4*, SS:207.7±42.5; ES:167.1±43.3 expressed as AU, n =7 to 9, *$P<0.05$ vs S). The results of mRNA showed an increase of GLUT4 expression in all groups compared to S (S:95.3±6.5, E:136.5±6.1*, SS:128,5±6,9*, ES:127.1±5.9* expressed as AU; n=8 to 10; *$P<0.01$ vs S). We can conclude that apparently the exposure to cigarette smoke during 2 months does not change glycemia and body weight, in fact. However, this exposure to cigarette smoke associated or not to exercise training impaired GLUT4 gene expression, affecting the regulation of this gene

at posttranscriptional level, since we can observe a higher mRNA content in both smokers groups associated to a reduced (SS) or maintained (ES) protein content. Thus, the exercise training can improve the GLUT4 expression only in non-smoking individuals.

No conflict of interest

Insulin secretion, dysfunction and the islet ß-cell

P-1260

Beta-cell function in individuals with a family history of type 2 diabetes mellitus

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To examine the susceptibility to develop type 2 diabetes in individuals with a family history of type 2 diabetes, 226 subjects residing in Bushenyi and Kasese districts of Uganda, were enrolled into the study in a matched pair design, between April and December 2006. Of these, 114 (41 men; 73 women), mean age 49 years (range 20 -70), and mean BMI 23.9 kg/m^2, had a family history of type 2 diabetes (FHD group); 112 (45 men; 67 women), mean age 54 years (range 23 – 70), and mean BMI 23.1 kg/m^2, were controls (Control group), who had no family history of type 2 diabetes.
A pair of fasting plasma glucose and fasting plasma insulin was determined in FHD and controls, and used to derive b-cell function and insulin resistance indices using homeostatic model assessment (HOMA). HOMA-%B and HOMA-IR parameters were not normally distributed and a log transformation was used in analysis; however for the sake of interpretation, the non-log transformed values are presented.
The b-cell function index was significantly (P = 0.03) lower in subjects with a family history of type 2 diabetes than in controls; (mean ± SD) %B was 63.0 ± 0.03 and 73.6 ± 1.48 respectively. Insulin resistance index, HOMA-IR was low and not significantly (P = 0.21) different between subjects with a family history of diabetes and controls; (mean ± SD) 0.77 ± 1.724 and 0.69 ± 1.578 respectively.
The prevalence (95% CI) of undiagnosed diabetes in FHD group was 7% (2.7 – 13.3%) and 2.7% (-0.3 – 6.1%) in controls.
The results indicate that there is an early but significant b-cell defect, with normal insulin sensitivity, in subjects with a family history of diabetes in this rural population. This may imply that factors associated with insulin resistance may play a secondary and probably minor role in the early pathogenesis of type 2 diabetes in this population.

No conflict of interest

P-1261

Usefulness of an OGTT-derived disposition index in clinical practice

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Aims: The close and inverse hyperbolic relationship between insulin secretion and insulin sensitivity is widely acknowledged. For a given degree of glucose tolerance, the product of insulin sensitivity times insulin secretion is constant and called "disposition index" (DI). The hyperbolic relationship also means that a change in one variable is mirrored by a reciprocal change of the other. Although this relationship is fundamental to understand the nature of type 2 diabetes, its use in clinical practice is restricted by measurements limited to i.v. infusions. In this study we tested the ability of the standard oral glucose tolerance test (OGTT), supported by measurements of plasma insulin values, to yield a surrogate DI index compatible with the hyperbolic relationship between its components.
Methods: A total of 1276 non-diabetic subjects (581 men and 695 women), who received a standard OGTT, were recruited. Both fasting (FPG) and the 2h plasma glucose (2hPG) concentrations and the corresponding insulinemic values (FPI and 2hPI) were used. We identified normal glucose tolerance (NGT), impaired fasting glucose (IFG), impaired glucose tolerance (IGT), the combination of these (IFG/IGT) and type 2 diabetes. Also, we calculated the estimated insulin sensitivity index (EISI) and the first phase of insulin secretion (1fsPH), as surrogate indexes of insulin sensitivity and secretion, as described by Stumvoll (Diabetes Care 2003), and indicated the product of these two variables as DI_o, the surrogate index of DI.
Results: NGT were 714 (55.9%), IFG 255 (20%), IGT 94 (7.4%), IFG/IGT 111 (8,7%), type 2 diabetes 102 (8%).The plot of EISI against 1fsPH displayed a hyperbolic function similar to that obtained with direct measurements, suggesting that DI_o may represent a good surrogate measurement of ß-cell function. In absolute terms, DI_o fell progressively from NGT (8.86 ± 0.8, mean ± standard deviation) to type 2 diabetes (4.91 ± 1.5, $p < 0.0001$), with intermediate values for the in-between steps of glucose intolerance ($F = 529.7$, $p < 0.0001$ by ANOVA performed with all 5 mean values).
Conclusion: Our results demonstrate that DI_o, obtained from OGTT related measurements of insulin sensitivity and secretion, effectively discriminates ß-cell function among the different groups of patients with glucose intolerance, and between the glucose intolerance group as a whole and normal subjects. These differences, detectable from mean values obtained in different groups, are suitable for population studies.

No conflict of interest

P-1262

Liraglutide monotherapy increases mealtime insulin response significantly more than glibenclamide monotherapy in Japanese patients with type 2 diabetes

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Aims: The once-daily human glucagon-like-peptide-1 (GLP-1) analogue, liraglutide, is associated with sustained improvements in glycaemic control with significant reductions in both fasting (FPG) and postprandial plasma glucose (PPG) levels. The effect on PPG may be modulated by regulation of postprandial insulin secretion by a glucose-dependent pathway. This report compares the effect of liraglutide treatment on HbA_{1c}, and mealtime insulin, glucose and glucagon levels to the effect on these parameters with glibenclamide treatment in Japanese patients with T2D.
Methods: In a 24-week, multi-centre, double-blind, randomised, parallel group trial 411 Japanese subjects (men: 67%, mean age: 58 years, duration of diabetes: 8.3 years, HbA_{1c} 8.3%) were randomised to liraglutide (0.9 mg/day, n=272) or glibenclamide (1.25 to 2.5 mg/day, n=139) once-daily. A meal test consisting of a Japanese breakfast at 08.00 h was performed at Weeks 0 and 24. An ANOVA model adjusted for treatment group, pretrial treatment and baseline values was used to analyse mean change from baseline.
Results: Mean HbA_{1c} reduction with liraglutide was -1.87% vs -1.37% with glibenclamide. For patients receiving liraglutide the mealtime insulin response (0–3 hours) after 24 weeks was significantly greater for subjects receiving liraglutide (n=226, AUC: 74.4 µU/mL*h) compared with glibenclamide (n=117; 66.5 µU/mL*h; p=0.0153). Meal-related plasma glucose profiles at 24 weeks were significantly lower with liraglutide (n=243; AUC: 32.1 mmol/L*h) compared with glibenclamide (n=119; AUC: 37.3 mmol/L*h; p<0.0001). The meal-related glucagon suppression at 24 weeks was significantly greater with liraglutide than with glibenclamide (n=243; AUC: 290.4 pg/mL*h vs n=119; AUC 316.9 pg/mL*h, respectively, p=0.0003).
Conclusion: Compared with glibenclamide therapy, treatment with liraglutide once-daily for 24 weeks was associated with significant improvement in glycaemic control which was mediated, at least in part, through a beneficial effect on postprandial plasma glucose levels. This improvement in PPG appears to be mediated, by improvement in postprandial insulin and glucagon secretion.

Conflict of interest:
Employee: Clauson, Katayama: Novo Nordisk
Commercially-sponsored research: Seino: Novo Nordisk

P-1263

Association of compensatory ß-cell dysfunction and obesity and plasma nonesterified fatty acid concentration in Korean young men with normal glucose tolerance

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Background and Aim: Obesity is known to increase the risk of the development of type 2 diabetes mellitus (T2DM), and the prolonged elevation of nonesterified fatty acid (NEFA) is also known to be an important factor attributed to progressive ß-cell dysfunction in T2DM. But association of obesity and NEFA with ß-cell function in young healthy people with normal glucose tolerance (NGT) is not well elucidated as yet. This study thus compared compensatory ß cell function according to obesity in Korean young men with NGT.

Methods: Standard 75g OGTT was performed in 362 healthy young men. Obesity was classified based upon the Asia-Pacific obesity criteria (Normal weight:18.5≥BMI<23, Overweight:23≥BMI<25, Obese:BMI≥25). The Whole Body Insulin sensitivity Index (WBISI) and $HOMA_{IR}$, Insulinogenic Index (IGI), and Disposition Index (DI = IGIxWBISI) and NEFA were measured.

Results: NGT was 260 (mean age 25.6±3.3 years). Compensatory ß-cell function (DI) was higher among overweight group than in the normal group (8.86 in overweight vs 7.04 in normal, P=0.055). But in the obese group, Disposition Index was significantly lower than the overweight group (6.46 in obese vs 8.86 in overweight, P=0.045). Regression analysis between BMI and Disposition Index showed a nonlinear relationship in spite of normal glucose tolerance. NEFA concentration was higher in the obese group compared with overweight and normal group, and NEFA had a negative linear regression relationship with Disposition Index (p=0.015). Also, after multiple regression analysis, NEFA showed a negative linear relationship with Disposition Index (p=0.017). In stratified analysis for NEFA concentration, the subject with NEFA more than 400 uEq/L showed significantly lower Disposition Index than subject with NEFA less than 200 uEq/L (p=0.009). And also, normal weight subject and obese subjects with NEFA more than 400 uEq/L had a low Disposition Index (5.84 in normal weight and 5.79 in obese, respectively).

Conclusion: This study suggests that obesity is associated with the decrease of compensatory ß-cell function in Korean young men with normal glucose tolerance. In particular, regardless of general obesity, metabolic obesity, which is status with elevated NEFA, may account for compensatory ß-cell dysfunction in the early stage of the natural history of type 2 diabetes.

No conflict of interest

P-1264

Uncarboxylated form of osteocalcin is associated with improved glucose tolerance via enhanced ß-cell function in middle-aged male subjects

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Introduction: Recent human studies support the notion that serum osteocalcin increases ß-cell proliferation and insulin secretion, and improves insulin sensitivity by regulating the expression of adiponectin. However, no study have examined the effects of serum osteocalcin gamma-carboxylation status on these associations or determined the role of uncarboxylated osteocalcin in glucose metabolism.

Objective and design: The aim of this study was to determine the effects of uncarboxylated osteocalcin on ß-cell function and insulin sensitivity in human. 199 men, aged 25 to 60 years (mean age, 47 yr), who had never been treated with glucose lowering agents, were enrolled in this cross-sectional study. Oral glucose tolerance test (OGTT) was performed and other metabolic parameters, such as body mass index (BMI), blood pressure, lipid profiles, liver function test, and both uncarboxylated and carboxylated osteocalcin plasma levels were measured.

Results: When subjects were divided into tertiles by uncarboxylated and carboxylated osteocalcin plasma concentrations, subjects in the upper tertile of each showed lower fasting and post-challenge glucose levels even after adjusting for age and BMI (P<0.05). Specifically, the upper uncarboxylated osteocalcin tertile was associated with higher HOMA-B% (homeostasis assessment model), which are representative of ß-cell function (P<0.05), and the upper carboxylated osteocalcin tertile was associated with lower HOMA-IR values, which are representative of insulin resistance (P<0.05).

Conclusions: Elevated levels of the uncarboxylated form of osteocalcin were found to be associated with improved glucose tolerance via the enhancement of ß-cell function in middle-aged male subjects.

No conflict of interest

P-1265

R325W polymorphism in the zinc transporter-8 gene attenuates the inhibitory action of cyclosporine on insulin secretion

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Objective: Recent genome association studies have revealed that the islet specific zinc transporter-8 polymorphism (R325W SLC30A8, rs13266634) is associated with type 2 diabetes and posttransplantation diabetes mellitus (PTDM). However the underlying molecular mechanism was unknown. Here we investigated the effects of this polymorphism on the insulin secretion inhibition by cyclosporine.

Methods: We made mutant type SLC30A8 cDNA by site-directed mutagenesis. Wild-type and mutant-type SLC30A8 constructs were transfected into INS-1E cells. Cells were pretreated with cyclosporine. We analyzed the amount of insulin secretion in response to glucose loading.

Results: There was no difference in amount of insulin secretion between wild-type and mutant when no glucose was loaded. Insulin secretion was reduced in cyclosporine pretreated cells. Cells transfected with mutant cDNA produced more insulin than cells transfected with wild-type SLC30A8.

Conclusions: These data suggested that R325W mutation attenuates the inhibitory effect of cyclosporine on insulin secretion in beta cell. Thereby this mutation is associated with lower prevalence of PTDM.

No conflict of interest

P-1266

In vitro testing to investigate the antidiabetic biological activity of Leonotis leonurus

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Insulin resistance and the resultant impairment in glucose tolerance are early signs of diabetes. The malfunctioning and/or death of ß-cells also contribute to the etiology of the disease. Hyperglycemia does not only cause ß-cell exhaustion, but, also impairs one or more key aspects of ß-cell physiology and gene expression. The aim of this study was to determine the anti-diabetic activity associated with Leonotis leonurus extracts in INS-1 cell line.

INS-1 cells were cultured under normo- and hyperglycemic conditions. Commercial marrubiin standard (M), the active agent in Leonotis leonurus, organic (OL) and aqueous (AL) extracts of Leonotis leonurus were screened for anti-diabetic activity in vitro. The stimulatory index of INS-1 cells cultured under hyperglycemic conditions was significantly increased by 60% and 61% ($P < 0.01$; n=5) in cells exposed to the OL extract (10µg/ml marrubiin) and marrubiin (500ng/ml), respectively, relative to the normoglycemic conditions. The gene expression of insulin was significantly increased by 76.5% and 71%, and of Glut-2 by 93% and 92.5% for M and OL, respectively, under the same conditions stipulated above ($P < 0.01$; n=4).The extract and M similarly showed an increase in respiratory rate under hyperglycemic conditions. Preliminary results therefore indicate an increase in oxygen consumption as a possible mechanism for the increased rate in insulin secretion under hyperglycemic condition.

No conflict of interest

P-1267

Rhein improved early-phase insulin secretion and reversed glucose intolerance in db/db mice

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Aims: Rhein (4,5-dihydroxyanthraquininone-2-carboxylic acid) is one of the anthraquininone derivatives isolated from rhubarb, a Chinese herbal medicine, which has been found to be of value in preventing the development of diabetic nephropathy. Few studies have examined anti-diabetic effects of rhubarb extracts and their constituents. In the present study, we determined whether rhein have hypoglycemic action and how rhein affect ß-cells in db/db mice.
Methods: Thirty 4-week-old db/db mice were randomized to treatment with rhein (120mg/Kg) (n=10), irbesartan (10mg/Kg) (n=10), and placebo (1% natrium cellulose solution) (n=10) by gavage for 8 weeks respectively. Body weight and non-fasting blood glucose level was measured every week. After 8 weeks' treatment, intraperitoneal glucose tolerance test (IPGTT), immunohistochemical staining of insulin were performed, and beta-cell mass was estimated by insulin-stained section. AUC (area under curve) of insulin levels in IPGTT was calculated to evaluate insulin secretory function, and $AUC_{INS0\text{-}30}$ was calculated as $(INS_{30}\text{-}INS_{0})$?15 to evaluate early-phase insulin secretion. Islet isolation and perifusion were performed to evaluate kinetics of insulin release in vitro, especially first-phase insulin.
Results: In rhein-treated group, the blood glucose concentrations at 0min, 60min and 120min after glucose load were significantly reduced. Simultaneously measured insulin levels at 30min and 60min were significantly higher than those of control, furthermore, rhein group presented a good early-phase insulin response, which indicated by an apparent positive $AUC_{INS0\text{-}30}$. In irbesartan- treated group, the blood glucose concentrations also decreased but only significant at fasting state. And the irbesartan group showed an improved insulin secretion at 60min of IPGTT ($P<0.05$). Perifusion showed that rhein-treated group manifested a notable increase of first-phase insulin secretion. And ß-cell mass was greatly rescued by 8 weeks' treatment by both rhein and irbesartan ($P<0.05$). Staining density of insulin were also notably improved in both rhein and irbesartan group when compared with control.
Conclusions: Rhein treatment initiated almost completely reversed glucose intolerance by significantly improved first-phase and early-phase insulin secretion on db/db mice. While irbesartan showed improved basal insulin secretion and decreased fasting blood glucose. And the characteristic of rhein may make itself a novel therapeutic means for preventing from or curing diabetes in the near future.

No conflict of interest

P-1268

Adult nesidioblastosis: an illustrative case and 10 years follow up

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Aims: To present a case report
Material and Methods: A 55- year-old female shows symptoms of asthenia, nervousness and neuroglycopenia with loss of consciousness, aphasia and temporary agnosia crises. These crises were at first sporadic, within 3 to 5 postprandial hours, becoming, as time elapsed, more frequent, intense and at any hour of the day. Biochemical assessments were normal. The patient underwent brain CT, MRI and EEG, splenic arteriography and abdominal MRI; all of them were normal. She developed recurrent neuroglycopenic symptoms within 24 hr, including a serum glucose level of 20 mg/dl, which again responded to intravenous 50% dextrose (Whipple's Triad positive). The patient was transferred to our institution. While in a monitored setting, she developed neuroglycopenic symptoms and measurable laboratory abnormalities including a serum glucose level of 30 mg/dl, a serum insulin level of 69 uU/ml and a serum C-peptide level of 4,9 ng/ml. The patient underwent surgical exploration. No specific lesion was palpated in the pancreas and intraoperative ultrasound was normal. The distal pancreas was resected to the left of the superior mesenteric vessels with a splenectomy. The histological picture showed: an increase in the number of endocrine cells in the shape of simple elements or small ones tied together in the center of the exocrine tissue and in some areas close to small ducts. Islets of a bigger size and irregular shape and distribution can also be observed; some of them in contact with the connective tissue, the interlobar ducts solely remaining. Every 6 months in 10 years follow-up the patient has subsequently remained euglycemic and asymptomatic without drugs. Fasting and 6-minute C-peptide values after intravenous administration of 1 mg of glucagon were normal. Pancreatic complications were absent.
Results: Nesidioblastosis is a disorder characterized by neoproliferation and disorganization of islet cells, which bud from pancreatic ducts. Intraoperative ultrasound is the most sensitive method of detecting all islet cell tumors, including tumors smaller than 1 cm not palpated at the time of surgery. The patient satisfied the diagnostic criteria for endogenous hyperinsulinemia: high plasma insulin and C-peptide concentrations during episodes of hypoglycemia.
Conclusions: The importance of this case lies in the low frequency of adult nesidioblastosis. There have been several reports of recurrent hypoglycemia or postsurgical diabetes even after a 95% resection of the pancreas.. We deem advisable to take this pathology into account in the presence of classical symptoms of hypoglycemia and use the detection methods necessary to confirm the disease.

No conflict of interest

P-1269

Pancreatic ß-cell function, insulin resistance and glycaemic control in Nigerians with type 2 diabetes mellitus

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Background: There is currently limited data on the relative role of pancreatic ß-cell function and insulin resistance together as determinants of glycaemic control in patients with type 2 diabetes mellitus in Nigeria.
Objective: To determine the relationship between pancreatic ß-cell function, insulin resistance and glycaemic control in Nigerians with Type 2 Diabetes Mellitus
Materials and methods: ß-cell function was determined by the measurement of basal and post glucagon C-peptide estimations and the calculation of the Homeostasis Model Assessment of Insulin Secretion (HOMA%B). Insulin resistance was assessed by calculation of the Homeostasis Model Assessment of Insulin Resistance (HOMA-IR). Glycaemic control was estimated using fasting plasma glucose and glycated haemoglobin (HbA_{1c}) in 40 subjects with type 2 diabetes mellitus and twenty control subjects.
Results: Mean ±SEM post glucagon C-peptide (PGCP) was lower in subjects with diabetes compared with the control subjects (2.9 ± 0.22 versus 5.6 ± 0.5 $p<0.05$). Subjects with diabetes had a significantly lower HOMA%B of 47.5±3.6% compared with HOMA%B of 62.7±4.7% in controls. ($p=0.02$).
The Homeostasis Model Assessment of Insulin Resistance (HOMA-IR) in the control subjects of 1.2±0.1 was similar to the subjects with diabetes (1.2±0.1). Of the subjects with diabetes, 27 (67.5%) had good glycaemic control (HbA_{1c} <7%). Multiple Regression analysis showed that HOMA%B was the major contributor to glycaemic control.
Conclusions: Pancreatic ß-cell dysfunction and insulin resistance were positively related to glycaemic control with ß-cell dysfunction being the major contributor.

No conflict of interest

Islets - beta cell damage and apoptosis

P-1270

Liraglutide induces human beta-cell proliferation and counteracts the deleterious effects of low density lipoprotein and IL-1beta

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Aims: Glucagon-like peptide 1 (GLP-1) analogs induce ß-cell proliferation and have anti-apoptotic effects in rodent islets. However, the proliferative capacity

of human ß-cell and its modulation by GLP-1 analogs remain to be fully investigated. The aim of this study was to determine whether the GLP-1 analog liraglutide affects ß-cell proliferation and to investigate whether liraglutide is able to counteract the anti-proliferative effect of low density lipoprotein (LDL) and the pro-apoptotic effect of interleukin-1ß (IL-1ß).

Methods: Human islets from cadaveric organ donors were dispersed into single cells and exposed to liraglutide for 2 days and co-stained for BrdU incorporation and insulin, allowing the determination of proliferative ß-cells. The anti-apoptotic effects of liraglutide against 2 ng/ml IL-1ß were tested in human islets cultured for 4 days and analyzed for cell death by the TUNEL assay. Islets obtained from LDL receptor -/- or +/+ mouse were cultured for 4 days in the presence of liraglutide and 3.1 mM LDL, isolated from healthy human plasma. Proliferation was assessed by analyzing BrdU incorporation.

Results: After 2 days incubation, liraglutide increased human ß-cell proliferation (unequivocally identified by insulin staining), in a dose dependent manner up to 3 fold. Moreover, 4 days incubation with liraglutide protected human islet cells from IL-1ß induced apoptosis. LDL decreased mouse islet cell proliferation independently of LDL receptor expression and this anti-proliferative effect of LDL was counteracted by the presence of liraglutide.

Conclusion: These results indicate that human ß-cell can proliferate in vitro in response to liraglutide. Furthermore, liraglutide protects human islet cells from IL-1ß induced apoptosis and counteracts the anti-proliferative effect of LDL in mouse islets, suggesting additional mechanisms for the anti-diabetogenic effects of liraglutide.

Conflict of interest:
Employee: L.B. Knudsen, Novo Nordisk
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P-1271

Improving the function of microencapsulated islets using co-encapsulation with pancreatic duct cells

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Islet transplantation has normalized the blood glucose levels in patients with type 1 diabetes. However, this treatment requires the use of potentially harmful immunosuppressive drugs. An alternative to immunosuppression is the use of semi-permeable microcapsules that allow the diffusion of glucose, nutrients and oxygen but protect the transplanted cells against immune reaction. Another important problem is the limited survival of encapsulated and free islet cells.

Pancreatic duct cells have been shown to play an important role in pancreas morphogenesis. The co-incubation of pancreatic duct cells and islets has decreased cell apoptosis and necrosis in the immediate post-isolation period. We have previously shown that incubating islets with IGF-II, the principal peptide that is secreted by duct cells, diminishes apoptosis and necrosis of encapsulated islets and allows the restoration of euglycaemia in diabetic mice using fewer islets.

The objective of this study is to investigate the effect of co-encapsulating islets with pancreatic duct cells on islet cell survival.

Pancreatic duct cells were isolated from C57BL/6 mice and their identity was confirmed by immunohistochemistry using antibodies against cytokeratin 7 (CK7) and IGF-II. The presence of known contaminants (fibroblasts and mesenchymals cells) was investigated by flow cytometry using their common marker: vimentin.

Islets encapsulated alone or co-encapsulated with two different concentrations of duct cells (20 or 100 cells per capsule) were maintained in culture and evaluated at days 1, 7, 14 and 27 post-encapsulation. Islet viability was evaluated using fluorescent dyes (acridine orange and propidium iodide), the percentage of necrotic islets by inverted-microscope analysis and their function by an MTS test.

Duct cells expressed IGF-II and CK7. The cell preparation was pure at >85%. Islets cell viability was between 60-80% for islets encapsulated alone or with duct cells with no significant difference. This co-encapsulation did not have a significant impact on the islets necrosis which remained consistently between 30-40%. Co-encapsulating islets with 100 duct cells had a significant impact on islet function (vs. islets encapsulated alone). This was demonstrated by the MTS test, which showed an absorbance at 492 nm of 0.32 ± 0.06 for co-encapsulated islets (vs 0.09 ± 0.01; $p<0.005$) at day 1 and 0.38 ± 0.12 (vs 0.10 ± 0.02; $p<0.05$) at day 27.

The present study demonstrated that co-encapsulation with duct cells had a moderate effect on islet function, but failed to show a positive effect on islet cell survival. Considering the concordant results of previous studies, the present results were unexpected. Further studies are needed to explain these results and will involve in vivo transplantation in diabetic animals.

No conflict of interest

P-1272

The effect of high carbohydrate and high fat diet on rat atherosclerotic process and pancreatic beta-cell apoptosis

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To examine the effect of high carbohydrate diet compared to high fat diet on atherosclerotic process and pancreatic b-cell apoptosis, three groups of Rattus norvegicus Wistar strain were fed with isocaloric high fat diet (GIII), high carbohydrate (GII) and "normal" diet (GI). Proinflammatory cytokines expression in aorta wall were assessed using immunohistochemistry, and foam cells were identified using oil red O and Meyer hematoxylin staining. B-cell density were assessed using hematoxylin eosine staining and b-cell apoptosis were identified using apoptek. Blood glucose level of was significantly higher in GII than GI (281.87 ± 39.66 mg /dl vs 192.5 ± 1.4 mg / dl, $p = 0.002$). Group II and GIII showed higher level of triglyceride compared to GI (138.0 ±47.15 vs 85.5 ± 20.3, $p = 0.02$; 163.62 ± 41.77 vs 85.5 ± 20.3, $p = 0.00$, respectively). Level of LDL was significantly higher in G III than G I (72 ± 35.6 vs 27.0 ± 8,9, p= 0.00). There were no significant difference in level of HDL among the three groups. VCAM-1, PPAR a, eNOS, TNF a, CD4 T helper and NFkB were significantly more expressed in GII and G III than GI ($p = 0.00$). The number of foam cells was significantly higher in G II and G III than in G I (7.18 ± 5.28 VS 1.2 ± 1.4, $p = 0.00$; 9.91 ± 6.26 VS 1.2 ± 1.4, $p = 0.00$,respectively). The pancreatic b-cell density was lowest in GII followed by GIII and the highest one was in GI (p=0.00)The pancreatic b-cell apoptosis was highest in GII, followed by GIII and the lowest was in GI (p=0.00).

We conclude that high carbohydrate diet as well as high fat diet potentially increase the risk of atherosclerosis. During an early stage of atherosclerosis, both diets induce endothelial dysfunction, inflammatory processes and increase foam cell formation. High carbohydrate diet may also increase pancreatic b-cell apoptosis leading to decrease of pancreatic b-cell density.

No conflict of interest

P-1273

The role of zinc in the pathogenesis of diabetes mellitus

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It is known that B-granules of pancreatic B-cells of human, rats, rabbits, dogs, mice and hamsters contain a large amount of Zn2+ions, which take part in the storage of insulin in B-cells. Today more than 30 diabetogenic chemicals are known that result in the selective destruction of B-cells and development of diabetes (DM). 19 are diabetogenic zinc-binding chelate active chemicals (DZB) which form complex salts with Zn 2+ions in the cytoplasm of B-cells. 18 belong to diabetogenic derivatives of 8-oxyquinolin (D8OX) and only 1 – Xanturenic Acid (XA) – is formed in human and animals as result of disturbances of tryptophan metabolism.

Aim of work: to evaluate the diabetogenic activity of Dithizone (DZ) and 8 D8OX derivatives – 8-para- (toluenesulphonylamino)quinolin, 8-benzyl (sulphonylamino)quinolin, 8-meta- (sulphonylamino)quinolin, 5-ortho-(toluene)-8-oxyquinolin, 5-amino-8-oxyquinolin, 5-meta- (hydroxyphenylazo)-8-oxyquinolin, 8-oxyquinaldinic acid, 8-oxyquinaldin, 4,8-dihydroxyquinolin-2-carboxylic acid (XA) – and determine the mechanisms of their action, leading to methods for the prevention of the destruction of B-cells.

Results and conclusions: On the basis of data previously obtained by us we conclude: 1) injection of DZB to animals results in binding of Zn+2-ions in B-cells within 2-5 min as evidenced by colored complexes of Zn+2-chelator in the cytoplasm and development of diabetes; 2) binding of Zn+2-ions in B-cells by D8OX and DZ followed by removal of chelator from this complex within first 5 min after formation does not cause death of B-cells and developing of DM in 95% of animals; but binding for 15 min and longer results in complete destruction of B-cells and development of DM in 100% of animals; 3) destruction of B-cells is initiated by destroying B-granules, which contain almost all of Zn+2-ions in the B-cells, that results in the destruction of the cell matrix on 30-40% of cell's surface 15-20 min later and on 90-95% 2h

later; 4) prevention of the formation of Zn+2-chelator complexes in B-cells completely prevents the destruction of B-cells and development of DM in 95-100% of animals; 5) destruction of B-cells may be completely prevented by: a) preliminary non diabetogenic binding of Zn+2-ions in B-cells by Na salt of Diethyldithiocarbamic acid, Cystein and L-Hystidine; b) by complete elimination of Zn+2-ions from B-cells before in vivo administration of DZB; c) by interception of DZB in tissue culture nutrient media by introduction of Zn+2-ions as ZnSO4. For destruction by XA, the preferred preventative is d) prolonged treatment with vit.B6 to inhibit endogenous synthesis of XA.

No conflict of interest

P-1274

Inhibition of synthesis of diabetogenic metabolites of tryptophan by pyridoxine (II)

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Chronic deficiency of vit.B6 (pyridoxine) in animals and humans results in inhibition of synthesis of Pyridoxal-5-Phosphate which is the direct cause of intensive endogenous synthesis of Xanturenic Acid (XA), a main diabetogenic metabolite of disturbances of Tryptophan metabolism. XA is one of 18 diabetogenic derivatives of 8-oxyquinolin (D8OX) and is synthesized in vit.B6 deficient humans.

Aim of work: try to inhibit endogenous synthesis of XA in rats maintained on diet to stimulate endogenous synthesis of XA (starch-52%, casein–22%, butter-15%, sugar -5%, yeast-3%, mineral salt-3%) for 4 months by the prolonged administration of. vit.B6.

Methods: 2 groups of animals, 18 in each: 1) diet only; 2) diet+vit.B6. Blood glucose control (BG) weekly; Xanturenic acid in urine (XAU) assayed monthly; histology: staining of pancreas sections by aldehydefucshine and of insulin by immunohistochemical method with measuring stain intensity (IG).

Results: 1) before diet: BG-4.7±0.4 mM, XAU-0.035±0.004 mg/ml; 2 months on diet: BG-5.5±0.5 mM, XAU-0.142±0.024 mg/ml; 4 months on diet: BG-10.8±1.2 mM (8.9-12.2 mM), XAU- 0.424±0.076 mg/ml; histology: necrosis and destruction of B-cells on 35-40% of islet's surface in 38 of 51 islets investigated (75%); decreasing of insulin content in B-cells: IG-0.26±0.04 (in intact B-cells-1.00±0.03); 2) 16 animals before diet and treatment by vit.B6: BG-4.6±0.6 mM; XAU-0.028±0.007 mg/ml; 2 months on diet + vit.B6: BG-4.7±0.4 mM; XAU-0.067±0.014 mg/ml; 4 months on diet+vit.B6: BG-5.6±0.6 mM (5.1-6.0 mM); XAU-0.078 ±0.016 mg/ml; histology: partial necrobiosis on 25-30% of B-cell's surface in 29% of islets from 100 investigated; in other 71% without changes; IG-0.87±0.04 (in intact B-cells-1.00±0.04; 2a) 2 animals on diet+vit.B6: before: BG-4.8±0.5 mM; XAU-0.036±0.007 mg/ml; 4 months on diet: BG-4.8± 0.5 mM; XAU-0.036±0.007 mg/ml; BG-8.7±0.7 mM; XAU-0.146±0.027 mg/ml; histology: destruction of B-cells on 12-15% of islet's surface in 28 of 55 islets investigated (49%); IG-0.58±0.04 (in intact B-cells-1.00± 0.05).

Conclusion: In animals maintained on diet stimulating endogenous synthesis of XA, 4 months prolonged administration of vit.B6 resulted in inhibition of XA synthesis, evident decreasing of XA in the urine, and reduction in developing symptoms of diabetes in majority of animals.

No conflict of interest

Islets - insulin secretion and signal transduction

P-1275

Diabetes influences histaminergic regulation of the process of the human amniotic epithelial cells (HAEC) differentiation into pancreatic beta-like cells (PBLC)

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Aim: Recent studies revealed that histamine is involved in pancreatic beta-cell differentiation and insulin secretion. HAEC resemble stem cells and express both H1 and H2 histamine receptors. HAEC in this study were isolated from the amnions obtained after pregnancies complicated by diabetes class C (after White), (group I/culture I; n=10) and after normal pregnancies (group II/culture II; n=10). We compared (group I vs II) expression patterns of H1 and H2 in HEAC cultured in vitro at different stages of nicotinamide-induced differentiation into PBLC.

Methods: HAEC were cultured in normoxia in 24-well cell culture plates (1.0 million cells per well) in Ham's F12 and Dulbeco's modified Eagle medium with 10% fetal calf serum. Altogether, 60 cultures were established. On Day 5, the medium was supplemented with nicotinamide (10 mM). C-peptide concentration in the culture medium collected every 3 days for 15 days was determined by ELISA as an indicator of differentiation into PBLC. At the same intervals the supernatants were removed and the cultures formalin-fixed paraffin-embedded for H1 and H2 receptors immunostaining. Quantitative immunohistochemistry was used for evaluation of H1 and H2 expression.

Results: C-peptide was detected on Day 6 in both cultures and the concentrations were kept gradually increased until Day 12, then stayed at almost the same level, 4,8-fold and 3,5-fold higher than initially (culture I and II, respectively). Expression of H2 was significantly ($p<0.05$) decreased in culture I and amounted (mean % value, ±SEM) 67,91 ±11.34 at the first measurement. Beginning on Day 9, another decrease was noted during consecutive evaluations in both groups. The mean decline in H2 receptor expression was significantly less in culture I, and amounted (mean % value for the measurements performed on Day 12 and Day 15, ±SEM) 55.37 ±12.02 of the value obtained in culture II. Initial expression of H1 was significantly lower in group I (74,32% ±10.87). The differences in H1 expression were not observed during nicotinamide-induced differentiation.

Conclusion: Considering the role of histamine H2 receptors in cell differentiation and possible effects of diabetes on this process, overproduction of C-peptide by diabetic HAEC differentiating into PBLC may be a consequence of a kind of "preconditioning" in proinflammatory environment with unstable glycaemic control.

No conflict of interest

P-1276

Expression of Dexras1 in pancreatic b-cells is modulated by prolactin and glucocorticoid pathways

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Increased glucose-induced insulin secretion is a trademark of maternal pancreatic b-cells adaptation during pregnancy. This adaptation is believed to be a result of increased STAT5 activation due to high levels of prolactin (PRL). Glucocorticoids (GCs) are known to counteract PRL action and suggested to account for the rapid return of maternal endocrine pancreas to the non-pregnant state. To date, the precise molecular mechanism underlying GCs action is poorly understood. Dexras1 is a member of small G-protein family that is strongly and rapidly regulated by dexamethasone (DEX). It has been suggested that Dexras1 is involved in the regulation of cell morphology, growth and neuronal secretion. So far, the expression and putative function for Dexras1 in pancreatic b-cell has not been settled. The present study was undertaken to examine Dexras1 expression in insulin secreting cells and whether it is correlated to the functional changes of the maternal endocrine pancreas. Additionally, we assessed the possible participation of PRL and GC crosstalk signaling pathways in Dexras1 expression. In order to achieve this goal, gene expression was assessed by RT-PCR and protein content was analyzed by Western Blotting, both in pancreatic islets isolated from 19 day pregnant (P19) and three day lactating (L3) rats and in RINm5F cells treated with PRL (500ng/mL), DEX (100nM) or PRL+DEX. STAT5 interaction to glucorticoid receptor (GR) was assessed by co-immunoprecipitation. Dexras1 was knocked-down by specific siRNA and STAT5b binding to Dexras1 promoter was analyzed by chromatin immunoprecipitation assay (ChIP). Insulin secretion was measured by RIA in MIN6 after Dexras1 knockdown. Dexras1 expression is decreased in pancreatic islets from P19 and increased in that from L3 rats. As expected, DEX increased Dexras1 expression in the presence or in the absence of PRL. DEX induced a rapid STAT5/GR association. ChIP analyses revealed that STAT5 binds to Dexras1 promoter. PRL decreases and DEX increases STAT5 interaction to Dexras1 gene. The combination of PRL and DEX exhibited no effect when compared to untreated cells. STAT5 binding to Dexras1 was diminished in P19 and augmented in L3 islets. Dexras1 knockdown led to an increase in cumulative insulin secretion. Our results show that Dexras1 is expressed in pancreatic beta cells. Dexras1 expression is positively modulated by DEX which is likely to account for the increased DEXRAS1 in L3 pancreatic islets.

Our data suggest that Dex-induced Dexras1 expression results somehow from increased STAT5 binding to Dexras1 promoter, probably bound to GR. Finally, the increased insulin secretion induced by Dexras1 knockdown points to an important role of this protein in maternal pancreatic islet physiology during the peripartum.

No conflict of interest

P-1277

Pancreatic antibodies and fasting C-peptide in children with type 1 diabetes mellitus from Romania

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Aims: In order to develop methods for preventing type 1 diabetes mellitus (T1DM), it is very important to know its pathogenic mechanisms. The aim of this work was to characterize a cohort of children with T1DM regarding pancreatic antibody (PA) positivity and fasting C peptide concentrations and to evaluate the influence of disease duration on these parameters.
Methods: The study group comprised 117 children with T1DM, 61 boys (52.1%), mean age ± SD 12.7 ± 3.1 years (range 4 – 18 years), mean disease duration ± SD 1.8 ± 1.6 years (range 0 – 11.4 years), admitted in „Cristian Serban" Clinical Medical Center from Buzias (Romania) in year 2006. Islet cell antibodies (ICA), GAD65 antibodies (GADA), IA-2 antibodies (IA-2A) and fasting C peptide were measured. Results were expressed as units of optical density (UOD) for ICA, units/ml (U/ml) for GADA and IA-2A and ng/ml for fasting C peptide. The threshold for PA positivity was considered 97.5th percentile from a control group (n=73), matched for age and sex: 0.67 UOD for ICA, 3.7 U/ml for GADA and 4.83 U/ml for IA-2A. Normal values for fasting C peptide were between 5th and 95th percentiles from the control group: 0.57 – 4.17 ng/ml. The statistical methods used were unpaired t test and Fisher's exact test.
Results: Taking into account the duration of T1DM, the study group was divided into 4 subgroups: 0-1 year (n=33), 1-2 years (n=34), 2-3 years (n=20) and >3 years (n=30). The positivity for the 3 PA and the values of fasting C peptide are shown in the table.
Table. PA positivity and fasting C peptide values in children with T1DM

Parameter	Study group (n=117)	Disease duration (years)			
		0-1 (n=33)	1-2 (n=34)	2-3 (n=20)	>3 (n=30)
PA+, n (%)	51 (43.6)	17 (51.5)	18 (52.9)	7 (35)	9 (30)
ICA+, n (%)	17 (14.5)	7 (21.2)	7 (20.6)	2 (10)	1 (3.3)
GADA+, n (%)	17 (14.5)	5 (15.2)	6 (17.6)	4 (20)	2 (6.7)
IA-2A+, n (%)	31 (26.5)	10 (30.3)	9 (26.5)	5 (25)	7 (23.3)
Fasting C peptide Mean±SD, ng/ml Normal C peptide, n (%)	0.27 ± 0.46 17 (14.5)	0.44 ± 0.57 9 (27.3)	0.24 ± 0.31 3 (8.8)	0.23 ± 0.67 2 (10)	0.14 ± 0.21 3 (10)

From the 51 patients PA+, 39 (33.3%) were positive for 1 PA, 10 (8.6%) were positive for 2 PA and 2 (1.7%) were positive for all the 3 studied PA. The positivity for PA and for ICA was significantly lower in patients with disease duration >2 years, compared with the rest: 16/50 (32%) v. 35/67 (52.2%) (p=0.03) and 3/50 (6%) v. 14/67 (20.9%) (p=0.03), respectively. The positivity for GADA and IA-2A did not depend on disease duration. Mean fasting C peptide concentrations and the percentage of patients with normal C peptide decreased significantly 1 year after the diagnosis of T1DM was established: 0.20±0.40 ng/ml v. 0.44±0.57 ng/ml (p=0.03) and 8/84 (9.5%) v. 9/33 (27.3%) (p=0.02), respectively.
Conclusion: In children with T1DM, the positivity for PA and for ICA decreases significantly 2 years after the diagnosis of T1DM, the positivity for GADA and IA-2A lasts longer and fasting C peptide decreases significantly 1 year after the onset of the disease.

No conflict of interest

P-1278

Dual-oxidase 2 (DUOX-2) as an important regulator of insulin receptor signaling

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Aims: The strength of receptor signaling is centrally controlled through a cooperative loop between Ca^{2+} and an oxidant signal and dual oxidase 2 (Duox-2) is the source of that reactive oxygen species (ROS). Therefore, we undertook the present study to see the role of Duox-2 in insulin receptor signaling.
Methods: A-20 and NIH-3T3 cell lines were transfected with siRNA and shRNA. Western blot (WB) analysis with isolated RNA performed to see the phosphorylation activity of different molecules involved in insulin signaling. Proliferation assay, fixed confocal microscopy (Bio-Red MRC-1024/Radiance 2100) and confocal live cell imaging (Nikon TE-2000-E) were performed on siRNA and ShRNA treated and non-treated A-20 and NIH-3T3 cells.
Results: Production of ROS (H_2O_2) in A-20 and NIH 3T3 cells (as evidenced by DCF fluorescence) is more in recombinant insulin stimulated normal cells than siRNA and shRNA transfected cells. Fluo-4 AM fluorescence, where cells were transfected with shRNA against Duox, shows considerable decrease of Ca^{2+} mediated fluorescence after recombinant insulin stimulation. WB analysis with cytoplasmic lysates from NIH 3T3 cells, under shRNA mediated knock-down of Duox for 24 hours as well as non-knockdown cells showed reduced signaling in shRNA knock-down cells as reflected by decreased level of phosphorylation. The magnitude of signaling was significantly reduced in active signaling molecules like molecules of MAPK pathway (pRaf, pERK, pJNK) as well as pSrc416, pPLC, pPKC, pPKD and pIκB relevant to insulin signaling. Proliferation assay suggested that Duox knock-down causes drastic reduction in cell proliferation and stimulation of the cells with recombinant insulin does not rescue the inhibitory effect.
Conclusion: Duox-2 is at least one of the important enzymatic sources of ROS that has important role in insulin receptor signaling pathway.

No conflict of interest

P-1279

Ghrelin is expressed in non- insulin, non-glucagon cells within the adult human pancreas and stimulates insulin secretion in INS1 beta cells through a mechanism involving NO

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Ghrelin is a multifunctional hormone that has been shown to regulate glucose homeostasis, although this effect is controversial, with reports of both stimulation and inhibition. We have found ghrelin expression in adult human pancreatic islets that is not co-localized with insulin or glucagon. This population of ghrelin cells may regulate nearby beta cells. The aim of the current study was to investigate the actions of ghrelin using the beta cell line INS1. Binding experiments revealed that INS1 cells have ghrelin specific binding sites, representing GHS R1a, as GHS R1a antagonist [D-Lys^3] GHRP6 competed with ghrelin for the same sites. One hr treatment of INS1 cells with ghrelin in the presence of 11mM glucose stimulated insulin secretion (0.01nM ghrelin: 53% increase, 46.27pg/mg protein ±8.2 (SEM), 10nM ghrelin: 50% increase, 45.23pg/mg protein ±8.3 vs control 30.13pg/mg protein ±2.9) as measured by insulin RIA. Inhibition of NO synthase inhibited the stimulatory actions of ghrelin on insulin secretion, while blockade of Kv channels had no effect. Quantitative RT PCR analysis of INS1 cells treated with ghrelin for 16hr indicated a 55% decrease of proinsulin transcript. These results indicate that ghrelin plays a divergent role in regulating insulin secretion and expression.

No conflict of interest

Indigenous communities and ethnicity issues

P-1280

Screening for diabetes mellitus type 2 in urban native and alien populations of the Republic of Khakasia

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The Republic of Khakasia is the part of Russian Federation and situated in the southwest part of Eastern Siberia. The total area of Khakaia is 61,900 sq.km. The population is 583,200 and represented by natives (khakases, 11%) and aliens (caucasians, 89%). The climate of Khakasia is distinctly continental.
Aims: to screen for diabetes mellitus type 2 (DM2) in native and alien inhabitants of the Abakan, the capital of Republic of Khakasia.
Methods: The target cohort of this study was selected randomly from 120,514 residents with age 20+. There were 4,955 residents (518 natives-4% of total native population and 4,437 aliens- 3.7% of total alien population of Abakan) participated in the study. Two-step strategy was used. The blood glucose was determined at random time. Those with glucose > 5,5 were examined with 75g oral glucose tolerance test (OGTT). WHO (1999) diagnostic criteria were used to determine the diagnoses of diabetes and impaired glucose regulation.
Results: OGTT examination (response rate 98.3% for aliens and 100% for natives) found DM2 in 62 persons and impaired glucose tolerance (IGT) in17 persons. DM2 was found in 53 aliens (16 men and 36 women in 36-75 year age group, mean: 57±10 years) and in 9 natives (1 man and 8 women in 46-75 year age group, mean: 58±10 years). IGT was found in 16 aliens and only 1 native. All residents with newly diagnosed DM2 and IGT had risk factors. All native persons with detected DM2 and IGT were obese.
Conclusion: Our screening program for DM and IGT implemented in Abakan town indicated that the prevalence of undiagnosed DM2 in urban population in Republic of Khakasia among native inhabitants is 1.74% (95% CI: 0.61 - 2.87), among alien inhabitants is 1.20% (0.88 - 1.54). The prevalence of undiagnosed IGT in urban native population is 0.19% (0-0.56), and in urban alien population is 0.36% (0.18-0.54). According by State register for DM in Republic of Khakasia the prevalence of diagnosed DM2 in population with age 20+ is 2.13%. Our data shows that the real prevalence of DM2 in Khakasia Republic perhaps two times higher.

No conflict of interest

P-1281

Prevalence of diabetes among immigrants to Canada

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Aims/background: Diabetes prevalence is increasing in both the developed and developing world, the latter contributing a large percentage of recent immigrants to Canada. We undertook a population-based study of immigrants to Ontario to establish whether diabetes prevalence was higher than in the general population, and to identify high-risk groups.
Methods: Provincial administrative health and immigration records were linked and used to calculate age-specific and age-adjusted point prevalence rates for men and women (aged 20+) on March 31st 2005, by immigration status. Rates were compared for 1,122,771 immigrants by country and region of birth, and for long-term residents. Logistic regression was used to identify and quantify diabetes risk factors among the immigrant population.
Results: After controlling for age, immigration category, education, income and time since arrival, diabetes risk in male and female immigrants respectively from South Asia was OR=4.01 (95% CI: 3.82-4.21); OR=3.22 (95% CI: 3.07-3.37), Latin America and Caribbean OR=2.18 (95% CI: 2.08-2.30); OR=2.40, (95% CI: 2.29-2.52); and sub-Saharan Africa OR= 2.31 (95% CI 2.17 – 2.45); OR=1.83 (95% CI 1.72-1.95).
Increased risk started at an early age (35-49) and continued in older age groups.
Diabetes rates in immigrant women were similar to their male counter-parts.
Conclusions: Immigrants to Canada of South Asian and African ethnic origin have rates that are 2-4 times higher than those of immigrants of European origin. In these high risk groups diabetes develops at a very young age and the high risk continues throughout the adult life-course. Contrary to studies conducted in North American and European populations where risk has been found to be higher in men, men and women of South Asian and African racial ancestry have equally high rates. Health professionals and policy-makers need to be aware of the increased risk for diabetes and opportunities for prevention in women and young people belonging to specific ethnic groups.

No conflict of interest

P-1282

Linking health care administrative data and laboratory data to study differences in progression of diabetic renal disease in first nations people and other Saskatchewan residents

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First Nations People (FN) with diabetes have higher rates of end stage renal disease (ESRD) compared to other Canadians but the underlying reasons are unclear. The purpose of this study was to compare demographic features and selected laboratory indicators of diabetes care in FN and other Saskatchewan residents (OSK) sub-divided by pre-ESRD chronic kidney disease (CKD) stage and requirement for renal replacement therapy (RRT).
Prevalent cases of diabetes for 2005/06 were identified using the Canadian National Diabetes Surveillance System case definition in Saskatchewan health care administrative data. De-identified cases were linked with laboratory data from laboratories in the two largest health regions in Saskatchewan. Diabetic FN and OSK subjects were sub-divided by CKD Stage using eGFR (MDRD equation) based on serum creatinine, age, and sex (Normal - eGFR 90+/ negative urine microalbumin [MA]; Stage 1 - eGFR 90+/positive MA; Stage 2 - eGFR 60-90; Stage 3 - eGFR 30-60; Stage 4 - eGFR 15-30; Stage 5a - <15/ no RRT; Stage 5b - RRT). Differences in age, sex, and quality indicators (from practice recommendations for A1C, LDL and MA in the Canadian Diabetes Association 2003 Clinical Practice Guidelines) were compared between groups. We identified 2,321 FN and 21,886 OSK with diabetes in the two health regions. From those, eGFR was calculated in 992 FN (42.7%) and 14,054 OSK (64.2%). Overall, 56.6% of FN had positive MA compared to 48.4% of OSK. FN were younger than OSK (mean age 52.7 vs 64.2 years) and more likely to be female (59.6% vs 45.4%). Mean A1C was significantly higher in FN (8.2% vs 7.4%) but mean LDL was identical (2.7 mM). When sub-divided by CKD Stage, 49.4% of FN and 24.9% of OSK were normal or Stage 1. In contrast, there were larger proportions of OSK in Stages 2 (52.4% vs 37.6%) and 3 (20.8% vs 10.6%). Finally, there were more FN than OSK in Stages 4 and 5a (2.4% vs 1.9%) and on RRT (2.3% vs 0.8%). Subjects in Stages 3-5a were older (mean age OSK 73.3; FN 62) than those receiving RRT (mean age OSK 61.1; FN 55.2). This was particularly evident for OSK who also displayed the largest age differential.
Despite poorer glycemic control and higher rates of microalbuminuria, a larger proportion of diabetic FN have normal kidney function or Stage 1 CKD compared to OSK who are older and predominately clustered in CKD Stages 2 and 3. The excess burden of diabetic ESRD among FN may be due in part to age/sex-related lower mortality allowing a larger proportion of those with early CKD to progress through the CKD Stages. We are currently conducting survival analyses to study this hypothesis.

No conflict of interest

P-1283

Fasting insulin levels higher among adolescents than adults: an erosion of public health

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Populations in dietary transition are characterized by a gradual abandonment of traditional-local foods towards an increased consumption of imported store-bought foods. They show, most of the time, an increased prevalence of Type 2 diabetes and obesity. As a result, many Pacific islanders are already suffering the consequences of their dietary transition, particularly obesity.

Aims: We examine the health transition between rural and urban population in French Polynesia, and how far the transition was implemented across age.

Methods: Maohi adolescents aged 12 to 17 years (n=117) and adults 18 year old and over (n=98) from four French Polynesian islands - Tahiti (urban area; capital of French Polynesia), Tubuai, Raivave and Rapa (rural; Austral Islands) - were invited to participate in the cross-sectional "Dietary and health transition in French Polynesia" study. Anthropometric measurements (body weight, waist and hip circumference) were obtained by standardized protocol; body composition was assessed by bio-impedance analysis and fasting plasma insulin (FPI) and blood glucose (FBG) levels were also obtained.

Results: Among adult participants, 59% reported BMI=30kg/m^2 while 54 % of adolescents were identified with a significant likelihood of persistence of obesity into adulthood, and among them around 28% had BMI ≥95th percentile (CDC growth charts). No difference between gender or island of residency was detected. Among adults, T2D was self-reported by 17% of participants and impaired fasting glucose was detected in 26%. Surprisingly, adolescents had higher FPI concentrations than the generations of their parents and grand-parents did. FPI decreased significantly with age, as presented on Figure (P-value<0.0001), with no difference according to residency. In the meanwhile, adolescents had significantly lower FBG than adults (P-value<0.0001) and generally showed normal glucose values (9% of impaired FPG only). Adolescent also showed median energy intakes (2753 kcal) higher than adults (2612 kcal among 18-49 years old and 2217 kcal among over 50 years old; P-value =0.012) as well as higher carbohydrates consumption (345g vs 291g among 18-49 years old and 242g among over 50 years old; P-value <0.0001).

Conclusion: We observed an inverted trend of fasting insulin level across age, and this needs to be further explored with appropriate measurement of insulin resistance. These findings, along with high frequency of overweight among adolescents, might be the first indicator of a drastic increase of type 2 diabetes among French Polynesian youth.

No conflict of interest

P-1284

Romani population in Serbia at an increased risk for diabetes

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The prevalence of diabetes in Serbia according to the IDF Diabetes Atlas is 5.6%, but according to the National Registry is 6.7%.

Aim: to investigate the prevalence of diabetes in the Romani population of Serbia.

Methods: Diabetes Association of Serbia screened 11 urban and 8 rural Romani communities in Serbia. Blood glucose values, name, age, presence of diabetes, presence of obesity and family history were noted.

Results: Statistical analysis was performed on 1465 Romani subjects (825 in urban, 641 in rural settlements) with complete findings. Mean age of the subjects was 42.2±15.7 years. Obesity was present in 577 (39.4%) people. Some 87 of the 1465 Roma subjects (5.9%) already had diabetes. Additional 76 new cases of diabetes type 2 (5.2%) were discovered. Romani people with diabetes were significantly older (F=28.33; p,0.01). Family history for diabetes was positive in 1/3 of the Roma subjects. Obesity was significantly more prevalent in Romani people with diabetes (X^2= 32.555; df=3; p,0.01). Diabetes was significantly more present in urban communities (X^2=25.205; df=2; p<0.01).

Discussion: The prevalence of diabetes in Roma people is unknown. They live in closed communities with frequent migrations. However, family ties are strong, which may explain the positive family history for diabetes. Obesity is connected to poverty. Roma people living in urban settlements have greater stress and everyday survival challenges. Future work should aim at diabetes care delivery.

In conclusion, Romani population may have a higher prevalence rate than the general population of Serbia. The risk factors for diabetes are middle age, family hsitory, obesity and life in urban communities.

No conflict of interest

P-1285

Diabetes and My Nation: a model program for diabetes teaching and treatment in aboriginal communities

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Diabetes and my nation: a community based health management program (model) to achieve evidence-based outcomes for the prevention and management of type 2 diabetes (T2DM) in First Nations communities by applying culturally appropriate and holistic methods integrated with Western Medicine and computer based technologies. Essential components include: Bridging between all stakeholders; Awareness and screening; Education (classroom / interactive technology); Lifestyle modifications ; Monitoring (conventional / e-health); Treatment (conventional / e-health); Community capacity building and health structure change (based on the Expanded Chronic Care Model). This provides the basic elements of: understanding traditional healing methods including the medicine wheel (physical, spiritual, mental, and emotional) the introduction of western medicine, and addressing the impact of Residential Schools.

Screening included: blood sugar, blood pressure, A1c (if BS is over 11.1 mmol/L), weight, height, and waist circumference.

Education: Consisted of three programs:

1. The Circle of Diabetes Self-Management (adults). The circles formed reviewed one of the ten Diabetes and My Nation DVDs every month with a diabetes nurse educator (or guest speakers). Participants monitored their blood sugar level on a regular basis; the local nurse collected their meters once a month and discussed the results. A1c, lipids and other indicators were monitored in accordance with the CDA Guidelines. Blood pressure was measured. Local nurse advised family physicians and provided advice to patients. A diabetes specialist had one-on-one visits with patients during the circle meetings or via internet contact. The nurse consulted with the specialist on specific cases. Considerable health improvement was seen, particularly with cases that started insulin. Communities were also visited by a Mobile Telemedicine Diabetes Clinic.
   The program utilized "diabetes and my nation.com" educational materials (DVDs and website) which included 26 hours (10 DVDs) of diabetes information. The majority of contributors were Aboriginal physicians, nurses, health educators, traditional healers, nutritionists and community members.
2. Our Spirit Lives: A youth program for ages 15-20, learning about diabetes and its preventiont through cultural activities, sports, and production of their own DVD.
3. Health Warriors: A school program for children ages 10-15, learning about diabetes; gaining knowledge and sharing it with the community and their families.

Outcome assessment demonstrated satisfaction of health care workers and patients, increased awareness in the community, changes in lifestyle (physical activity and diet), and lowering of A1c, BP, and Lipids.

Conclusion: This program was a remarkably successful model for assisting the reduction in diabetes' adverse effects in First Nations communities.

No conflict of interest

P-1286

Simulation model of the intra- and inter-generational impact of gestational diabetes on the diabetes epidemic in Saskatchewan First Nations People

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Gestational diabetes (GDM) may lead to increased risks for type 2 diabetes in both affected women and their offspring (intra- and inter-generational effects). The goal of this research was to use simulation modeling to evaluate the contribution of GDM to the diabetes epidemic in Saskatchewan, and to compare these effects between First Nations people (FN) and other Saskatchewan Residents (OSK).

We constructed a dynamic simulation model that replicated the evolution of diabetes in Saskatchewan over time. To characterize the demographics of the province, we classified the total FN and OSK populations by age (children 0-14, reproductive age 15-44 and post-reproductive age 45+), sex, presence of overweight/obesity and diabetes (yes/no). To capture the impacts of diabetic pregnancies, women in the model were categorized by pregnancy status (yes/no), presence of GDM or pre-existing diabetes, and history of GDM. Second, we classified individuals by birth weight and intra-uterine exposure to diabetes. The model was initialized to the estimated status of the FN and OSK populations in 1956, and the model simulated the evolution of diabetes in the populations over 50 years. Parameter estimates were taken from the literature and from author-derived primary data. Less known parameters were estimated via calibration to historical data related to demographics, vital statistics, and the epidemiology of diabetes in Saskatchewan.

The model closely reproduces historical trends of population size, mortality and birth rates, diabetes prevalence and incidence, and reported rates of GDM. The model shows that while the intra- and inter-generational effects of GDM have made only modest contributions to the diabetes epidemic amongst OSK, they are responsible for a significant fraction (>40%) of all diabetes cases amongst FN. The results further suggest that the intra-generational effect appears rapidly and largely accounts for the disproportionately elevated rates of diabetes currently observed in FN women compared to men. In contrast, the inter-generational effect builds more slowly over decades but may eventually surpass the intra-generational impact.

GDM appears to be a major contributor to the diabetes epidemic amongst FN and possibly other populations. This creates unique opportunities for primary prevention initiatives for adolescent females and reproductive age women that are enhanced by the high degree of motivation, short time span and close contact to the health care system that are characteristic of pregnancy. Programs designed to prevent and screen for GDM, optimize management of diabetic pregnancies, and provide follow-up initiatives for women who have experienced GDM, have potential for reducing T2DM rates in both mothers and their offspring.

No conflict of interest

P-1287

A culturally sensitive community-based obesity prevention program targeting Latino-Canadian children: a pilot study

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Aims: Worldwide, rates of childhood obesity continue to rise, especially among new immigrants in developed countries. This is a result of rapid "westernization", which includes changes in dietary intake and a shift towards a more sedentary lifestyle. Compounding this issue are the additional challenges facing these families including cultural barriers and social constraints that limit access to healthy foods, recreational activities, and health promotion programming. The complexity of the issue demands an interdisciplinary approach to develop innovative interventions for these high-risk populations. In partnership with key local stakeholders, we have designed and piloted a culturally and linguistically sensitive community-based obesity prevention program that targets overweight and obese Latin-Canadian children (6-12 years) and their families.

Methods: The program consisted of two principle components: I) obesity screening and II) a 6-month intensive obesity risk management intervention. Community-based obesity screening evaluated children's diabetes risk profile based on their body mass index (BMI) and family history of diabetes. The intensive 6-month intervention was designed to address the unique challenges and needs of migrant overweight and obese children and their families. The program, delivered by trained lay health advisors, promoted and educated families about healthy eating and active living; improved access to healthy foods and physical activity opportunities; enhanced the self-efficacy of families; addressed cultural, social, and economic determinants of health; and stimulated community capacity. Changes in BMI Z-score; percent body fat; fitness level; physical and sedentary activity levels; dietary intake; and self efficacy at baseline, three months, and six months of the program were evaluated.

Results: 178 Latin children were screened, 71 (40%) of these children were identified as overweight and obese, and 67 were enrolled into the 6-month intensive obesity risk management intervention. The intervention demonstrated favourable changes in children's lifestyle and BMI (n=56). Specifically, statistically significant increases in children's physical activity level (+46 min per day) and fruit and vegetable consumption (+1.1 servings/day); and decreases in screen-related activities (-55 min/day), junk food consumption (-3.3 times/week), and BMI Z-score (-0.1) were observed. No changes were observed in other outcome measures.

Discussion/conclusion: A culturally and linguistically sensitive community-based intervention that targets not only unhealthy behaviours, but key social and economic issues facing new immigrant families, offers a promising strategy for screening and engaging high-risk migrant families for childhood obesity prevention.

No conflict of interest

P-1288

Risk factors of type 2 diabetes among migrants and native populations of Spain: DE-PLAN and VIVA-Minorities Studies

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Aims: Spain has one of the highest rates of migration in Europe (13%). Migrants are at higher risk of developing type 2 diabetes (T2D) than the native Spanish population due to an unfavourable risk factor profile and lifestyle habits. The aim of this study was to compare the risk factors of T2D between migrant and native populations in Spain.

Methods: A population-based survey in five provinces of Spain (Madrid, Toledo, Segovia, Burgos and Avila) was conducted in 2008. A proportional random sample of 1.184 Spanish natives (53% women) and 224 first-generation migrants (62% women), 45-64 years old, was selected from the population registers. The overall response rate was 70%. The risk of T2D was assessed using the FINDRISC questionnaire. A score of more than 14 points was considered as high risk of T2D (>20% 10-year risk for diabetes). Weight, height and waist circumference were measured following a standard protocol.

Results: There was no statistical significant difference in the prevalence of high risk of T2D between the native Spanish and the migrant population. The proportion of high risk of T2D was 22% in men and 27% in women in the Spanish population, whereas the respective figures were 15% (men) and 22% (women) in the migrant group. No statistical significant difference was found in body mass index (BMI), waist circumference and use of antihypertensive drugs in men between the two population groups. Women of the migrant group, however, had a statistically significant higher prevalence of central obesity (waist circumference > 88 cm; 68% versus 50%; p-value <0.001) and obesity (BMI > 30 kg/m^2; 40% vs. 30%; p-value 0.03). Despite not significantly different, the native population showed higher self-reported daily physical activity and vegetable and fruit consumption than migrants.

Conclusions: The migrant male population has similar lifestyle habits and risk factors of T2D as the native Spanish men. However, migrant women have higher prevalence of obesity and central obesity than their Spanish counterparts. Special attention may be needed for this vulnerable population group.

No conflict of interest

P-1289

Visiting "in" Peru: a comparison of anthropometric and metabolic parameters between diabetic patients and non-diabetics in Abancay, Apurimac, Peru

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Aims: Ethnicity is a well known risk factor for diabetes, and Latin Americans are particularly susceptible; a low socioeconomic status is a predictor of non-communicable disease among adults in Peruvian cities, but few data are available about diabetic patients of the Andean region of Peru. Our team of voluntary health-care professionals was asked to co-operate with C.M. Santa Teresa - Abancay, Apurimac. Our aim was to evaluate some clinical and metabolic parameters of the local population, with emphasis on diabetics and "pre-diabetics".

Methods: We worked in Abancay, in Curahuasi, and in Pueblo S. Mateo, a small centre in a mountain area. The following data were collected with standardized procedures: height (m), weight (kg), BMI; fat mass (%), detected by a portable bio-impedance meter; blood glucose (fasting or post-prandial) (mg/dL), using reflectance meters. Electrocardiograms were performed with a Cardiette-micro appareil (Elettronica Trentina, Italy); funduscopic evaluations were obtained by our Orthoptic specialist. Finally, complete clinical evaluations were performed.

Results: We report data expressed as median values ± SD from 423 native Peruvians (F: 263; M: 160). Normo-glucose tolerant (NGT) Peruvians (n: 312; F: 204; M: 108) showed: median age 50.5±17.0; BMI 26.6±4.3. Waist circumference was 93.8±12.4 cm (F: 93.5±12.9 cm; M: 95.2±11.3 cm). Fat Mass resulted 32.1±7.6% (F: 34.8±6.7%; M: 27.1±6.7%). Fasting glucose (mg/dL) was 88.1±10.9; post-prandial glucose revealed 105.9±17.4. Peruvians suffering from Diabetes Mellitus (DM) (n: 111; F: 58; M: 53) showed: median age 57.5±12.2; BMI 27.0±4.5 (F: 28.1±4.0; M: 25.9±4.7). Waist circumference was 98.7±11.8 cm (F: 99.2±11.2 cm; M: 98.3±12.5 cm). Fat Mass resulted 32.4±8.2% (F: 36.8±6.2%; M: 27.2±7.4%). Fasting glucose (mg/dL) was 184.9±94.7; post-prandial glucose revealed 286.5±137.3. Background retinopathy was detected in less than 2% of Peruvians DM. More than 16% of Peruvian diabetics showed abnormalities in ECG evaluations.

Discussion: NGT were younger in comparison with DM Peruvians; BMI was higher in DM women. A higher deposition of abdominal fat in diabetics is confirmed by waist circumferences, stating a real burden for cardiovascular disease for Peruvian diabetics, specially for women. We were surprised by the very high levels both of fasting and post-prandial glucose in DM Peruvians.

Conclusion: In our short period of activity in the Apurimac region, a typical Andean land of Peru, and probably one of the poorest, we found a low attention to diabetes and non-communicable disease. Most people didn't know what diabetes is, neither the burden of overweight and obesity, nor the risks connected with diabetic chronic complications.

No conflict of interest

P-1290

Diabetes and relatedness in an Aboriginal settlement in Central Australia

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Grounded in ethnographic research conducted in 2006-2007 and 2009 on how Aboriginal people in Central Australia cope with diabetes mellitus, this paper discusses the importance of creating pragmatic and culturally sensitive long-term health promotion programs for the chronically ill. An analysis of participant-observation and semi-structured interviews with 84 diabetic patients and their kin show how an understanding of contemporary life-style embedded in a post-colonial demand-sharing economy, the traditional nexus between Aboriginal notion of personal autonomy and relatedness, as well as Aboriginal engagement with several healing practices, is key to rethink a desired and sine qua non partnership among patients, their kin, and health-care personnel. An in-depth discussion of sharing practices and healing beliefs and practices provides a basis on which to ground much-needed culturally-sensitive health promotion program in the socio-political complex environment of Central Australia.

No conflict of interest

P-1291

Subscapular thickness is strongly associated with blood glucose and insulin levels than waist circumference and BMI in the mixed ancestry population of South Africa

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Background: Obesity, particularly central obesity is strongly associated with the development of insulin resistance and type 2 diabetes. On one hand, subscapular skinfold thickness has previously been found to be better than BMI and WC in identifying hyperinsulinemia in Asian Indian males. Because the mixed ancestry population of South Africa is a combination of European settlers, the indigenous Africans and the Indians we investigated the relationship between measurements of obesity and fasting blood glucose and insulin levels in the mixed ancestry population of South Africa.

Methods: In a cross-sectional study, fasting blood was obtained from 600 subjects within the age group of 35-65 years who were randomly selected through multistage random sampling within the Bellville South area of Cape Town. Blood glucose was measured using a routine chemistry auto-analyser whilst insulin was analysed using a commercial immunoassay. Waist circumference, hip circumference, Body Mass Index (BMI), subscapular, supra-iliac, mid-upperarm, triceps and bicepc thickness were measured on all participants.

Results: Obesity as measured by BMI was significantly more prevalent in females, $p < 0.05$. In a linear regression analysis waist circumference, subscapular and age were positively associated with fasting blood glucose and insulin levels, $P < 0.001$ whilst the triceps were negatively associated with insulin levels, $P = 0.018$. On the other hand BMI was not significantly associated with insulin levels, $P = 0.075$, but not with fasting blood glucose levels.

Conclusion: Central adiposity is considered to be an accurate anthropometric method to estimate truncal adiposity, a key predictor of insulin resistance subsequently type 2 diabetes. However, differences in obesity phenotype have resulted in different cut-off values for different populations with Caucasians having higher cut-off values than Asians. This study suggests that subscapular thickness in addition to waist circumference can be used to predict insulin resistance risk in this population group.

No conflict of interest

P-1292

Diabetes, gender and neighbourhood ethnicity: inequalities in healthcare resource utilization

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Aims: Lower utilization of medical resources by immigrants is often observed in self-reported surveys and usually interpreted as the so-called healthy immigrant effect. However, whether the lower utilization rate by immigrants is solely a reflection of better health or is indicative of barriers to accessing the health system is not clear. In this study, we examine the gender-specific differences in healthcare resource utilization between neighbourhoods with varied immigrant density based on patients' medical records.

Methods: For healthcare planning purposes, the entire population of Richmond, BC, Canada is geographically grouped into five neighbourhoods with similar population size: South Arm, Richmond Centre, Blundell, Steveston

and East Richmond. The expected health resource dependency for each resident was assessed using the Johns Hopkins University Adjusted Clinical Group (ACG) case-mix system that accounts for his/her morbidity, complexity and costs of care with the overall Richmond rate as baseline. For each neighbourhood we aggregated the observed hospital bed-days and primary care physician use across all ACG categories and compared them with the corresponding expected values obtained by applying Richmond's ACG-specific rates. The resulting differences are used to signal if resources are under or over used for that neighbourhood. Healthcare use due to pregnancy, obstetrics and relevant complications were excluded as they preclude gender based comparisons.

Results: Overall, diabetic women were more likely to visit their primary care physicians and less likely to stay in hospitals compared to diabetic men. No obvious neighbourhood variations in the use of primary care physicians both among diabetic women and among diabetic men were observed. Taking the entire Richmond female population as baseline, however, we found great neighbourhood differences in hospital use by diabetic women. Diabetic women from the two neighbourhoods with the lowest proportion of immigrants had the greatest use of hospital resources (18.5% higher in Blundell and 5.2% higher in Steveston) whereas diabetic women from the neighbourhoods with the highest proportion of immigrants used less hospital resources (18.6% lower in East Richmond and 10.5% lower in Richmond Centre) than expected. No such effect was observed for diabetic men.

Conclusions: In this study we demonstrated that diabetic women from neighbourhoods with a high density of immigrants used less hospital acute care. This could indicate the existence of potential barriers of gender, language, and ethno-culture to immigrant diabetic women. The results can be used to help health authorities and policymakers respond to the needs of immigrant women by addressing potential barriers to the access of health care.

No conflict of interest

P-1293

Has waist-thigh ratio stronger association with type 2 diabetes mellitus than BMI or waist circumference? The case of the Brazilian Xavante Indians

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Introduction: Presently, the Brazilian Xavante Indians are undergoing an intense and fast cultural change towards the general Brazilian society, and as a consequence are presenting high prevalence of obesity and diabetes mellitus. Objective: To investigate which anthropometric measurements of fat distribution have a stronger association with the presence of diabetes.

Methods: A cross-sectional study was conducted among 351 Xavante Indians aged 20 years or more in October 2008 and January 2009. After signing an informed consent form, all individuals underwent clinical and anthropometrical examination and submitted to a 75g oral glucose tolerance test. Using WHO criteria, diabetes was diagnosed in 74 (21.1%) individuals, obesity (BMI > or = 30 kg/m^2) in 157 (44.7%) and overweight (BMI > or = 25 and < 30kg/m^2) in 133 (37.9%). According to receiver-operating characteristics analysis, waist-thigh ratio had a better profile to identify individuals with diabetes than BMI, waist-hip ratio or waist circumference. The cut-off point which best predicted the presence of diabetes has sensitivity and specificity around to 70%.

Conclusion: The use of the waist/thigh ratio provides an easy and practical marker that is better associated with the presence of type 2 diabetes. With further studies in other ethnic groups, the waist/thigh ratio may be useful tool for clinical practice and epidemiological research.

No conflict of interest

P-1294

Quantification of the prevalence of insulin resistance by a homeostasis model assesment in the Tsuraku community, Pastaza-Ecuator in January 2009

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The insulin insensitivity is a diminished in the biological function of the insulin characterized by need for high level of plasma insulin for maintenance of the metabolic homeostasis.

The present is a descriptive transversal analytical epidemiological study of a point that determines the prevalence of the Insulin resistance, evaluated through Homeostasis Model Assesment (HOMA IR) in a Shuar Community in the Ecuadorian Amazonia. In this ethnic group had been observed a high prevalence of chronic metabolic disturbance, this fact is consider it outstanding, since previous studies have reported ethnic differences with regard to the insulin sensitivity. The analyzed variables are: Age, Gender, Body mass index, waist circumference, blood pressure, fasting plasma glucose, fasting plasma insulin, Homa IR. It was done in the Tsuraku community, located to 51 kilometer at the distance of the Capital of the Province of Pastaza-Ecuador is constituted by a shuar ethnic nationality.

The randomized 34 individuals more than eighteen years old the insulin resistance was determined through Homeostasis Model Assesment (HOMA IR). We found a global prevalence of 11,8 % of insulin resistance. 26,7 % in the females. The average of age was of 30,35 years ± 12,94, in females 26,67 years ± 9,56. The average of body mass index was 25,5 ± 3,11, in females 24,02 ± 2,78. The average of waist circunference was 80,77 cm ± 8,94, in females 77,42 cm ± 7,32. It is being evidenced an important the resistance insulin prevalence mainly in women in spite of being young and with normal anthropometry. Whatsoever could be related with lower levels of waist circumference in this population.

No conflict of interest

P-1295

Screening indigenous communities for diabetes and its complications: 5 year results from a mobile diabetes outreach service in Alberta, Canada

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Aims: The Mobile Diabetes Screening Initiative (MDSi) provides diabetes and complications screening to Métis [1], off-reserve Aboriginal [2], and other remote communities in Alberta. MDSi aims to mediate access barriers and empower clients and providers to more active risk factor, diabetes and complications management.

Methods: Two vans with health staff and portable screening technology travel to 24 communities. Anthropometrics and clinical parameters (BP, FPG, A1c, cholesterol, triglycerides, microalbumin) are collected on clients at risk for diabetes. Diabetic clients receive eye, foot, cardiovascular and kidney screening, and complete a survey assessing diabetes knowledge, diabetes management and access to diabetes care services. Screening results take 6 minutes and counseling is provided. Results are sent to clients' physicians.

Results: The population seen by MDSi identifies as 56% Métis, 20% Status/ Non-Status Aboriginal (First Nations), and 24% non-Aboriginal. Since 2003, MDSi has screened 2102 at-risk clients for diabetes (1760 adults; 343 children ages 6-17). 65% of children screened were overweight/obese, and 38% were identified with pre-diabetes. 364 diabetic clients were screened for complications.

Adults screened for diabetes		
BMI	Overweight/Obese	80%
FPG	Pre-diabetes	46%
	Probable diabetes	5%
Total Cholesterol	Abnormal	32%
Blood Pressure	Abnormal, no treatment	15%
	Abnormal, on treatment	6%

Diabetic clients		
BMI	Overweight/Obese	95%
A1c (diabetes control)	Good	45%
	Poor	55%
Total Cholesterol	Abnormal	28%
Blood Pressure	Abnormal, no treatment	22%
	Abnormal, on treatment	42%

Survey: 245 diabetic clients completed the survey. 82% said their family doctor was their main diabetes care provider; 65% saw their main provider 3+ times in the past year; 29% had A1c tested in the past 6 months. 36% never had an eye assessment; 81% had never seen a podiatrist; 10% never had a cholesterol test; 60% had a urine test in the past year. Only 49% had seen a dietitian. 68% of respondents used pills to control diabetes; 16% used diet alone. When asked how often A1c, cholesterol, feet and eye testing is recommended for people with diabetes (CDA-CPGs, 2008), most respondents answered correctly.
Discussion: MDSi screening identifies high diabetes risk in Indigenous communities. Baseline survey data shows few clients receive testing at appropriate intervals, despite most clients seeing their main diabetes care provider 3+ times in a year. Our findings are consistent with similar studies on health care gaps for Aboriginal and non-Aboriginal people in remote areas of Alberta. (Toth, 2003; Oster, forthcoming 2009). [1] The Métis issued from mixed marriages during the period of Canada's colonization, and evolved a distinct culture and are recognized as a distinct Aboriginal group in Canada's Constitution. [2] A different screening program serves on-reserve Aboriginal (First Nations) Communities.

No conflict of interest

P-1296

Insulin, hydrocortisone and lipid changes among native and alien patients with obesity and newly diagnosed type 2 diabetes in the Republic of Tyva

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The Republic of Tyva is a part of Russian Federation with the area 168.6 square km. It is situated in the South of the Eastern Siberia in the geographic center of the Asia. The climate is sharply continental. Total population is 308,500 and represented by natives (tyvinians, 77%) and aliens (caucasians, 23%). The native peoples still continue to follow their traditional lifestyle and nutrition. The diabetes 2 type prevalence for native population with age 20+ was 2.67 (95%CI: 2.63-2.71) /1,000 and for aliens was 11.52 (10.50-11.52)/1,000 inhabitants.
Aims: To compare serum insulin, hydrocortisone and lipid levels and their relationships in native and alien persons with obesity and firstly diagnosed (fDM2) in Tyva Republic.
Methods: Natives and aliens: with normal weight (27, 22), overweight (17, 24), obesity (14, 23) and fDM2 (36, 14) were studied. Waist circumference, BMI, blood glucose, serum insulin and hydrocortisone levels before and after 75 g glucose load, HOMA-IR, lipid profiles were measured.
Results: Among native peoples the body mass gain was accompanied by increase of insulin, hydrocortisone and total lipids without changes in lipid profile. Native patients with fDM2 had a lipid profile disturbances with a high level of triglycerides and rise of atherogenic index. Serum Insulin and hydrocortisone were higher among fDM2 patients than in subjects with normal BMI. Among alien peoples the body mass gain was accompanied by increase of insulin and total cholesterol without changes of hydrocortisone levels. Aliens with fDM2 had high cholesterol and triglycerides levels. HOMA-IR was higher in native fDM2 patients than in alien fDM2 patients. There was a negative correlation between insulin and glucose levels in natives and aliens with fDM2. In natives with fDM2 there was a positive correlation between glucose and triglycerides. However in aliens with fDM2 there was negative correlation between glucose and total lipids and total cholesterol. Only in native subjects with fDM2 there was a negative correlation between hydrocortisone and insulin, hydrocortisone and HOMA-IR.
Conclusion: The revealed data indicate the important role of hydrocortisone in the regulation of glucose and lipid levels in obese and fDM2 native inhabitants of Tyva Republic.

No conflict of interest

Screening

P-1297

Effective uptake of screening blood-tests for diabetes in Canada

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Aims: To describe the extent of diabetes (DM) screening blood tests for various target groups in Canada, in order to identify potential areas where there may be benefit from refocused screening efforts. Also, to enable comparisons between physician and general population perspectives.
Methods: Self-reported data from PHAC's 2009 National Prediabetes Survey consists of two separate arms: i) a stratified random digit dialling (RDD) phone survey of the general population, ages 30 to 75 (GenPop n=1755); and ii) a combined phone/fax survey of Family Physicians (FP n=500). The GenPop arm was weighted by age, sex and province; the FP arm, by age, sex and payment mechanism.
Results: According to the GenPop survey (response rate of 15%) 49% of adults over age 40 without DM said they had received a screening blood test for DM sometime during their life; 58% of these had been within the previous 12 months. The testing rate for males (45%) was lower than for females (53%), and testing did not increase with age. 7% of females had received their most recent test during pregnancy. The testing rate was 57% among those reporting hypertension and 56% among those reporting dyslipidemia. Overall, 68% of those tested reported that their results had been explained to them. OGTT testing was 18% overall – with higher rates for females (24%) than males (11%). According to the FP survey (response rate of 8%), physicians order an average of 30 DM screening blood tests per week: 17 FPGs, 11 A1c, and 1.5 OGTTs. 93% of FPs reported they always (80%) or usually (14%) order a screening blood test for DM when doing an annual exam for adults 40 yeras and over. Among physicians, 93% said they screen for DM among hypertensives, and 86% said they screen for prediabetes.
Discussion/Conclusion: Persons with dyslipidemia or hypertension were more likely to report being screened for DM, suggesting that those at high risk of cardiovascular events are being given priority. DM screening and OGTT use among females was relatively high. This reflects the near universal screening of pregnant women using a modified OGTT in Canada.
With regular testing by FPs, overall GenPop rates of screening in the general population are expected to increase with age – but this was not observed. This incongruence may reflect recent increases in actual DM screening efforts aimed at younger ages, recall bias or other inherent limitations with self-reported survey data.
Significant screening effort is being expended across various target groups, relying mainly on FPG and haemoglobin A1c. Although most FPs reported screening for prediabetes, such screening is problematic given their modest use of OGTT: over half of all prediabetes cases will be missed if the OGTT is not used. This relates to ADA's 1998 recommendation to de-emphasize the use of the OGTT for routine screening.

No conflict of interest

P-1298

eZscan, a new non-invasive technology that enables early detection of carbohydrate metabolism abnormalities may also be able to detect ethnic differences

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Aim: To determine the ability of eZscan to detect prediabetes and diabetes mellitus (DM) in populations not known to have the conditions.
Methods: Two cross-sectional studies were conducted in Chennai, India with 200 subjects and in Shanghai, China with 102 subjects. All subjects had their medical history recorded, with presence of risk factors according to the

ADA criteria, followed by a medical examination, a 2-hr OGTT and lipid panel lab tests. They were then tested with the eZscan, which is a newly patented technology which uses low level DC inducing reverse iontophoresis, together with chronoamperometry to evaluate the functions of tissues in specific locations of the body. A reading of >40% was considered positive on the eZscan. The ADA criteria were used for the cut-off values of the OGTT. The AHA/updated NCEP criteria were used to define metabolic syndrome

Results: Of the 200 subjects from India (mean age:43.2 years; BMI:28.2; 50% male), 101 had NGT, 57 had metabolic syndrome (MS) and 24 had DM. The subjects from China (mean age: 58.6 years; BMI:25.3; 29% male) had 52 cases of NGT, 29 with MS and 21 with DM. The sensitivity of the eZscan for MS and DM in the Indian data was 75% and 83% and that of the Chinese was 94% and 80.9% respectively.

Discussion/conclusions: The eZscan appears to be a sensitive tool to detect prediabetes and diabetes when compared to the OGTT. The eZscan may also be able to detect differences in carbohydrate metabolism abnormalities in different ethnic groups.

No conflict of interest

P-1299

A study of urinary myoinositol 2h after 75g glucose loading as a sensitive marker of glucose intolerance

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Aims: Measurement of urinary myoinositol (UMI) requires a urine sample, but no drawing of blood. This reduces burdens on both the patient and medical staff. We have previously reported the usefulness of UMI increment between before and 2h after glucose loading (deltaUMI = UMI_{2h} - UMI_{0h}) to detect glucose intolerance. With this measurement, urine samples have to be collected twice (before and 2h after glucose loading) and a wait of 2h is required. To measure UMI more easily and comfortably, the present study examined the ability to detect glucose intolerance between UMI at 2h after glucose loading (UMI_{2h}) and deltaUMI.

Methods: A total of 392 volunteers underwent 75g glucose tolerance testing. We collected blood samples before, 1h and 2h after glucose loading and measured plasma glucose (PG) levels. Urine samples were collected before and 2h after glucose loading and both UMI and creatinine were measured simultaneously using enzymatic methods. Based on PG values and following the 2003 American Diabetes Association (ADA) criteria, we divided subjects into five groups: normal glucose tolerance (NGT); impaired fasting glucose (IFG); impaired glucose tolerance (IGT); IFG/IGT; and diabetes mellitus (DM). We then performed receiver operating characteristic (ROC) analyses of UMI_{2h} to examine the ability to distinguish NGT and IFG from other groups (IGT, IFG/IGT and DM). To confirm differences in ROC curves between UMI_{2h} and deltaUMI, we next compared areas under the ROC curve in both indices. Moreover, we compared the positive rate for UMI_{2h} in each groups with that of deltaUMI.

Results: All subjects were classified according to ADA criteria, with: 193 NGT; 70 IFG; 29 IGT; 55 IFG/IGT; and 45 DM. From the ROC curve, the optimum cutoff value for UMI_{2h} to detect glucose intolerance was 30 mg/gCr. With a UMI_{2h} cutoff value of 30 mg/gCr, sensitivity and specificity were 74% and 72%, respectively. As for deltaUMI, however, with a cutoff value of 10 mg/gCr, sensitivity and specificity were 79% and 72%, respectively. Sensitivity and specificity were almost the same in both indices. Both areas under the ROC curve were nearly equal (UMI_{2h}, 0.813; deltaUMI, 0.823) and no significant differences were found (p=0.763). Positive rates for UMI_{2h} were 19.7% in NGT, 50.0% in IFG, 44.8% in IGT, 76.4% in IFG/IGT and 91.1% in DM. Conversely, positive rates for deltaUMI were 19.7% in NGT, 50.0% in IFG, 55.2% in IGT, 81.8% in IFG/IGT and 91.1% in DM, respectively.

Conclusion: UMI_{2h} and deltaUMI display almost equal ability to detect abnormal glucose tolerance. Therefore, both deltaUMI and UMI_{2h} provide useful markers for mass screening in the early detection of glucose intolerance.

No conflict of interest

P-1300

The use of HbA1c as a screening tool for the diagnosis of diabetes mellitus in a local South African community

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Introduction: HbA1c has been the gold standard measurement of chronic glycaemia for over two decades. Diabetes mellitus (DM) may be diagnosed using WHO or ADA criteria – both use either a 2 hour or a fasting glucose level. This would require a fasting sample, thus leading to inconvenience for the patient and requiring an early morning appointment with the physician. There is a need for a more convenient screening test for DM or impaired glucose tolerance (IGT), which can be performed on a random blood sample. For a test to be an effective screening tool, a high sensitivity is required. Previous problems with HbA1c assay standardization, as well as its large biological variation, meant that it was not an effective screening tool. However, with the recent advances in standardization of the assay, there have been suggestions that HbA1c may be an effective screening tool.

Method: Six hundred participants in a community-based study were included. Seventy-eight were excluded as they were known diabetics. Five hundred and twenty-two patients not known with DM were screened for DM during a local community study using an oral glucose tolerance test according to both ADA and WHO criteria. HbA1c levels of >7% (n = 27), 6.5%-7% (n = 36) and < 6.5% (n = 459) were then correlated to DM or absence of DM.

Results: An HbA1c value < 6.5% excluded DM correctly in 93.9% of patients diagnosed according to ADA criteria (431/459) and in 91.7% of those diagnosed according to WHO criteria (421/459).

An HbA1c value of 6.5-7% was of limited use when distinguishing between DM or not (69.4% and 30.6% respectively using ADA criteria and 58.3% and 41.7% respectively using WHO criteria).

An HbA1c value of >7% as suggested, showed that using the ADA diagnostic criteria, 85.2% (23/27) of patients were correctly identified and 88.9% (24/27) using the WHO criteria.

Conclusion: It appears that that HbA1c may indeed be an effective screening tool for the presence of DM diagnosed according to both the ADA and WHO criteria in our local population.

No conflict of interest

P-1301

First trimester hemoglobin A1c and its correlation with abnormal GCT and subsequent development of gestational diabetes

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Background: Diabetes with onset during pregnancy and resolution postpartum is termed gestational diabetes. The current standard of care is screening for patient by a glucose challenge test (GCT) at 24-28 weeks gestation with further GTT testing if indicated. Data regarding the association between HbA1c and GCT is conflicting.

Objective: We set out to describe the normal values of first trimester HbA1c and see if it correlates with an elevated GCT in the second trimester.

Methods: We conducted a prospective descriptive study of 52 healthy, pregnant women between 18 and 45 years in the first trimester who come to Beth Israel Medical Center for routine prenatal care. Exclusion criteria included patients with diabetes mellitus. An HbA1c was sent with the initial prenatal labs and demographic data was collected. GCT at 24-28 weeks gestation and, if applicable, the GTT values were recorded retrospectively. The subsequent development of gestational diabetes, birthweight and the complication of a shoulder dystocia were also recorded.

Data Analysis: Data was analyzed using the SAS system for data analysis. Continuous variables are reported as means with standard deviations.

Categorical variables are reported as frequency counts and percent. Pearson correlation coefficients were computed to assess the correlation between HbA1c and GCT, BMI and age. P-values less than 0.05 are considered statistically significant. Correlation coefficients of 0.4 to 0.6 are considered moderate.

Results: 52 patients were enrolled. 50 patients had an HbA1c tested with their prenatal labs. 10 patients transferred care after the initial labs were drawn. 5 patients delivered at outside institutions. The remaining 35 patients comprised the study population available for analysis. For these patients, the mean HbA1c was 4.99 (st. dev.=0.29, range 4.3 to 5.6). The mean age was 29 (st.dev.=6.12), range 18 to 44). The mean BMI was 25.7 (st.dev.=5.6, range 19 to 37). The mean GCT was 96 (st.dev.=22.8, range 69 to 187). The mean birth weight was 3354 (st.dev.=659, range 900 to 4880). One subject had an abnormal GCT and subsequently a diagnosis of gestational diabetes. The Pearson correlation coefficient (r) between HbA1c and GCT was 0.41 (p=0.015). The correlation between HbA1c and BMI was r=0.24 (p=0.166). Correlation between HbA1c and age was r=0.32 (p=0.059). Correlation between HbA1c and birthweight was r=0.31 (p=0.068). No shoulder dystocias occurred in our study population.

Conclusion: Hemoglobin A1c in the first trimester is moderately correlated with GCT conducted in the second trimester of pregnancy. This correlation is statistically significant. Further research is warranted.

No conflict of interest

P-1302

Predictive value of waist-to-height ratio for the development of type 2 diabetes and impaired glucose tolerance: comparison with other anthropometric indices

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Background: Although body mass index (BMI), waist circumference (WC) and waist-to-hip ratio (WHR) have been used to predict type 2 diabetes (T2D) and glucose intolerance, waist to height ratio (WHTR) has not been well studied. We compared the value of WHTR with those of BMI, WC and WHR to predict T2D and impaired glucose tolerance (IGT).

Method: A total of 294 women and 219 men, all Caucasians, are included in this study. Each participant had the following measurements: weight, height, waist and hip circumference, lipid profile as well as fasting and 2h post 75 g oral glucose test (OGTT) plasma glucose. IGT was defined as plasma glucose concentration ≥ 7.8 and < 11.0 mmol/L. whereas diabetes was defined as plasma glucose ≥ 7.0 or ≥ 11.1 mmol/L after the OGTT. We performed logistics regression to evaluate the best anthropometric measurement that predicts (separately or combined) T2D and IGT and also to find relationships between anthropometric indices of obesity and age, sex, triglyceride (TG) and fasting plasma glucose (FPG) levels. Model had been adjusted for confounding factors such as sex and age, and ROC curves for sensitivity and specificity determinations have been calculated.

Results: Men and women were 55±10 and 52±10 yrs respectively; 54 had T2D and 118 IGT. The waist to height ratios (WHTR) were 0.59±0.07 in men and 0.55±0.08 in women. Ninety one percent of the men and 74% of the women were over the 0.50 boundary. The WHTR was the best predictor of combined T2D and IGT (p= 0.0022) vs. BMI (p=0.0097), WC (p=0.0177), and WHR (p=0.0802). WHTR correlated with BMI (r=0.88), WC (r=0.93) and WHR (r=0.66). WHTR increment correlated also with increasing age, TG and FBG. The specificity and sensitivity of WHTR were 77.7% and 78.6%, respectively.

Conclusion: WHTR is a simple parameter that can easily be used by physicians to predict T2D but also IGT. Our results suggest that WHTR may be a better predictor of T2D and IGT than BMI, WC and WHR, but our findings need to be confirmed in a larger population study.

No conflict of interest

P-1303

Metabolic disease in psychosis: addressing physical illness in the marginalised

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Introduction: Patients with mental illness, particularly psychosis, have a significant increase in the risk of cardiovascular disease (CVD), cerebrovascular disease and diabetes. Data from the Western Australian linkage database (2001) indicates that the mortality rate ratios are at least doubled for diabetes related deaths and more than three times for cerebrovascular disease in this group of patients. This significant increase is reinforced in more recent studies. Patients with schizophrenia and other psychoses have an increased risk of diabetes and metabolic disease which appears to be over and above the rise observed in the" normal" population, attributed to the mental illness itself, poorer lifestyle resulting in enhanced CVD risk factors and to the use of antipsychotics. Yet, the physical care of these patients has largely remained suboptimal.

Aims: The aim of this study was to establish the prevalence of cardiometabolic risk factors in an inpatient psychiatric population, within an integrated tertiary cardiometabolic monitoring centre, comprising multidisciplinary care from endocrinology and psychiatry health care workers.

Methods: Inpatients at the Concord Centre for Mental Health were screened with history (personal and family history of psychosis, cardiovascular disease, obesity, diabetes, hypertension, smoking, physical activity and dietary habits) physical examination (weight, height, body mass index, waist circumference and blood pressure) and biochemical testing (HDL, LDL, triglycerides, fasting glucose) specifically tailored to screen for cardiometabolic risk. The prevalence of metabolic syndrome using IDF criteria was determined.

Results: The mean age was 41.8 years (females) and 39.8% (males). 65% were current smokers, 31% and 46% had a family history of diabetes and CVD respectively. 40% had at least 1 parent of "at risk" ethnicity for diabetes. Waist circumference was elevated by IDF criteria in 82%, with a mean of 101.5 cm (females) and 103.2 cm (males). BMI was in the obese or overweight range in 68.4%. 20% had impaired fasting glucose or impaired glucose tolerance; 7.3 % had diabetes. High triglycerides and LDL were found in 59% (>1.7 mmol/L) & 47% (> 3mmol/L) respectively and low HDL (< 1mmol/L) in 68%. 36% were hypertensive. 50% had metabolic syndrome.

Discussion: Cardiometabolic risk factors are significant in patients suffering from schizophrenia and other psychoses. This data is sobering particularly in light of the relative young age of the subjects. These risk factors potentially would lead to high CVD morbidity and mortality.

Conclusions: Patients suffering from psychoses warrant active screening and management of these risk factors. Our data reinforce the need for multidisciplinary care for patients with psychosis in an integrated physical-mental health assessment centre.

No conflict of interest

P-1304

Improvement in weight management and lifestyle behaviors in elementary Argentinean school children

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Background: There is growing interest in understanding the role of lifestyle behaviors in children's weight status. While intensive lifestyle programs can have positive clinical outcomes in adults, few studies have reported successful interventions in children.

Objective: to determine if there were any changes in lifestyle behaviors, in weight status and/or in cardiovascular risk factors in school children after receiving a minimal lifestyle education. We further evaluated the efficacy of the program in the obese (OB) children in comparison to the non-OB group.

Design/methods: In a prospective one-year study, 210 children, were recruited from three schools in September 2007. Approximately 30% (n=64)

of subjects were randomized to study group and were examined at baseline and after 12 months in September 2008. All families were asked to attend 3 educational talks during one year about lifestyle education. Questionnaires about their children's lifestyle behaviors were done at baseline and after a year. BMI, waist, Tanner, lipid profile, and glucose were determined at baseline and a year later. Weight management success in obese children was defined as delta BMI percentile≤ 0 after a year.

Results: Sixty four (33 boys) children aged 8.44±1.37 were randomly selected to be evaluated 1 year later, because financial constraints did not make it possible to examine the whole group. There was not a significant difference in the mean BMI, (17.9 vs 18.0 ; p=0.76) and age (years= 8.4 vs 8.8; p=0.24) between the randomized group and the entire group. The children's mean age at baseline was 8.4±1.3 y, z-BMI = 0.4± 1.1, and waist 62.1±10.4cm. The prevalence of OB was 22% (n=14). The prevalence of children at Tanner 1, 2 and 3 was 85.2% 11.5% and 3.3% respectively. All families were in the lower socio-economic class: 72.4 % of parents had an elementary education or less. There were no significant differences between the OB (n=50) and non-OB groups (n=14) in age, Tanner, gender, HDL-C, and blood pressure at baseline. There was a higher mean level of triglycerides (p=0.03) in the OB group than in the non OB group. Eighty five percent of OB children had improvement in weight status after a year. There was a lower but not significant mean triglyceride (92.2 ±31.9 vs. 105.4 ±62.9, p = 0.4), and total cholesterol (148.1 ±21.8, vs.154.3 ±25.3 p = 0.3) after 1 year in the OB group. The BMI percentile was lower in the OB group after 1 year (96.6 ±2.2, vs.98.0 ±1.2 p = .002).No significant changes of BMI percentile were found in the non-OB group. Sweet beverage consumption decreased in the OB group (Mean 3.7 vs 3.1 glasses ;p=0.01) and in the entire group (3.14 vs 3.31; p=0.03) after a year. TV viewing decreased in the OB group (mean 3.14 vs 3.73 hrs ; p=0.02) after a year.

Conclusions: The reduced rate of weight gain in OB children and the improvement in lifestyle behaviors seen in this group after a minimal intervention suggest that the development of future metabolic disease could be avoided.

No conflict of interest

P-1305

A variation of serum creatinine is related to type 2 diabetes

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Aims: Creatinine is a break-down product of creatine phosphate in muscle, and is usually produced at a constant rate depending on muscle mass. It is well established that skeletal muscle is one of the major target organs of insulin action, and is associated with the pathogenesis of type 2 diabetes. So, we investigated whether serum creatinine is related to developing of type 2 diabetes and other risk factors of diabetes.

Methods: The study subjects were composed of 2735 non-diabetic patients who visited health care center from 01 January 2001 to 31 December 2003 and were followed up after 4-5 years, and were investigated retrospectively. The patients with higher baseline serum fasting glucose (=126 mg/dL, n=61) and higher serum creatinine (= 2 mg/dL, n=2) were excluded. Type 2 diabetes was defined as serum fasting glucose of =126 mg/dL, history of type 2 diabetes, or taking the oral hypoglycemic agents. A variation of serum creatinine (ΔCre) was defined as a difference between follow-up and baseline creatinine. Body composition analysis was included in follow-up examination.

Results: 60 subjects (male=43) developed type 2 diabetes. In patients group (who developed type 2 diabetes) and control group, baseline serum creatinine was 0.89±0.16 mg/dL vs 0.93±0.15 mg/dL (p<0.05). After 5 years later, serum creatinine in each group was 0.93±0.17 mg/dL vs 0.93±0.17. There was significant difference in ΔCre between patients developed diabetes and controls (p<0.05). Lower ΔCre was associated with an increased risk of type 2 diabetes after adjustment for age, sex, fasting glucose, HbA1c, ΔGTP, and Lipid profiles (Odds ratio 2.074 (1.040-4.137, 95% CI)). In 1601 male patients, lower follow-up serum creatinine significantly increased risk of type 2 diabetes (Odds ratio 5.140 (1.915-13.796, 95% CI)). Serum creatinine was positively correlated with muscle mass and negatively correlated with percent of body fat after adjustment for BMI.

Discussion/conclusion: Serum creatinine may reflect body muscle mass and may be regarded as one of risk factors of type 2 diabetes. This study is retrospectively observational study and has limitations such as small numbers of participants and low incidence of diabetes. So, further investigation will be needed.

No conflict of interest

P-1306

The predictive value of normal fasting glucose levels for the appearance of impaired fasting glucose

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Background: Impaired Fasting Glucose (IFG), defined as a glucose level of 100-125 mg/dl, is a known risk factor for developing Type 2 diabetes and cardiovascular disease. It has not been established, however, whether a higher glucose level within the normal range (i.e. glucose <100 mg/dl) is a risk factor for developing IFG.

Methods: Demographic data, laboratory results, and physical examination results were collected from 195 subjects (135 males and 60 females, average age 42.67 years). Each subject was examined twice, five to ten years apart (1st and 2nd time points), at the Periodic Examination Center, Western Galilee Hospital, Nahariya, Israel.

Results: A statistically-meaningful relationship was established between the glucose levels at the 1st and 2nd time points for all subjects: the entire population (Spearman correlation, rs=0.559, P<<0.001); subjects with glucose < 126 mg/dl (rs=0.49, P<<0.001, N=184); and subjects with normal glucose (rs=0.363, P<<0.001, N=139).

Subjects with normal glucose levels were divided into three groups according to their glucose level at the 1st time point: <87 mg/dl; 87-90 mg/dl; and 91-99 mg/dl. At the 2nd time point, IFG was found at 14.8%; 21.1% and 47.5% respectively (Cramer's V=0.341 P<0.001).

When different variables and their relation to the glucose level at the 2nd time point were examined, the strongest correlation was found with the glucose level at the 1st time point (0.363 P<<0.001). Other variables that were found to be significantly related to the 2nd glucose level (in subjects with normal glucose level at 1st time point) were: Body Mass Index, Triglycerides, Uric Acid, and systolic, diastolic and average blood pressure.

Following an examination of the relationship and relative influence among the above-mentioned variables, and their impact on glucose level at the 2nd time point, a multi-variant logistic regression model was applied. According to this model, a subject with glucose level of 91 mg/dl at the 1st time point is 3.2 times as likely to develop IFG compared to a subject with glucose level 86 mg/dl at that point. (Linear regression model P<<0.001, R=0.466).

Conclusion: Higher glucose levels within the normal range, are a risk factor for the development of IFG. More studies should be done in order to assess the extent of this risk factor and its clinical implication.

No conflict of interest

P-1307

Prevalence of gestational diabetes mellitus in pregnant women in Ahvaz

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Introduction: Gestational diabetes mellitus (GDM) is defined as any degree of glucose intolerance with onset or first recognition during pregnancy and is associated with increased feto-maternal morbidity as well as long-term complication in mothers and offspring. The aim of this study was to determine the prevalence of gestational diabetes mellitus in pregnant women in Ahvaz.

Material and methods: In this study, universal screening for gestational diabetes mellitus was performed for 678 pregnant women who had referred to two gynecologic and obstetric clinics in Ahvaz from April 2004 till March 2005. Screening was performed with 50g oral Glucose challenge test (GCT). with 140mg/dl cut-off point, then a diagnostic 100g oral Glucose Tolerance Test (OGTT) was done according to Carpenter and Coustan criteria.

Result: The prevalence of GDM and IGT were 7.4% and 4.3%, respectively. The average age of patients with GDM (30.32±5.27 years) was higher than healthy women (26.25±4.94years) obviously (p<0.001).The average number of pregnancies of patients with GDM (2.4±1.1) was higher than healthy women (1.9±1.1) obviously (p<0.003).Previous abortion frequency in women with GDM (30%) was higher than healthy women (13.85%) (p=0.002).The frequency of previous GDM in women with GDM (10%) was significantly higher than healthy women (0.33) (p=0.0001). Pervious history of macrosomia in women with GDM (6%) and in women with IGT (10.34%) were significantly higher than normal pregnancy (0.5%) (p=0.003 and p<0.001; respectively). There was no relationship between the prevalence of GDM and IGT with

previous congenital abnormalities, or still birth and number of parities. There was no relationship between the maternal age, number of pregnancies, previous abortion and previous GDM with prevalence of IGT.

Conclusion: According to result of this study, it seems that gestational diabetes mellitus has high prevalence in Ahwaz and screening should be done for all pregnant women without consideration of risk factors.

No conflict of interest

P-1308

A population survey to study the association between microalbuminuria and erectile dysfunction among patients with cardiovascular risk factors

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Aim: The primary objective of this study is to determine if microalbuminuria (MA) is associated with erectile dysfunction among patients with hypertension or other cardiovascular risk factors.

The secondary objective of this study is to analyze the prevalence of erectile dysfunction among patients with arterial hypertension or central obesity in comparison with data from the literature.

Methods: Patients members of regional associations whose goal is to manage patients with cardiovascular risk factors (hypertension, type 2 diabetes, hyperlipemia, obesity, tobacco) and to prevent cardiovascular events, were proposed to enter in the survey. Sociodemographic and clinical data were collected by trained nurses (weight, height, waist circumference, cardiovascular estimation by SCORE scale). A detection of MA on a morning collection (urine strip, Clinitek-Siemens company; strips are read on Clinitek status analyzer) were performed. MA is indicated as a ratio result of 30-300 mg/g of creatinine. Erectile dysfunction was evaluated with the IIEF questionnaire (short version) which is a 6 items questionnaire: when the score is equal or above 25, it means there is no erectile dysfunction. Statistical analysis was performed by CRESGE (INSERM unit; LILLE, FRANCE)

Results: The survey started in September 2008. 273 male patients have been enrolled in this ongoing study by December 2008.

In this group of patients, 60 had MA. Among these 60 patients, 51 had lower IIEF score (<25).

The relation with age has been studied: IIEF score significantly decreases with age (group with IIEF score <10; mean age = 69±9 versus group with IIEF score >25: mean age = 54±11 ; p<0,001).

The IIEF scores are lowest among patients with hypertension when compared to patients without hypertension (group with hypertension: IIEF score =14,4±8,25 versus group without hypertension: IIEF score =18,8±8,25 p<0,001).

Waist circumference appeared to be inversely correlated with IIEF score (linear regression: p<0, 05).

Conclusion: These preliminary results did not allow to confirm a significant relationship between IIEF score and the presence or not of MA. More patients are now enrolled in this study and it is highly probable that these results will be confirmed.

No conflict of interest

P-1309

Validation of screening procedures for gestational diabetes mellitus in a population of Cameroonian women

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Aims: The diagnostic test for gestational diabetes mellitus, GDM, 2h 75g oral glucose tolerance test (OGTT), recommended by the WHO is lengthy, costly and unaffordable to the majority of women and health systems in developing countries. Consequently, many do not do this test. To significantly reduce the number needing this test, thereby making it affordable, cost effective screening tests are needed. These will enable early and appropriate diagnosis and treatment which will reduce the incidence of complications. Performance and cut-off values for existing screening tests may vary from one ethnic group to another. It is therefore important to validate these screening tests in different ethnic groups before recommending them to the general population.

Methods: On a sample of 200 pregnant non-diabetic women in the North West region of Cameroon with gestational age between 24 and 28 weeks, RBG, FBG, 1h 50g oral glucose challenge test (OGCT), urine dipstick, and 2h 75g OGTT were done in two days for every participant. Sensitivity (Se), specificity (Sp), positive predictive value (PPV) and negative predictive value (NPV) calculated for each test using cut-off values found in literature against the 2h 75g OGTT as the gold standard were used to evaluate each screening test.

Results: Fourteen out of 200 screened women had gestational diabetes. Family history of diabetes was unknown in 50%, pre-pregnancy weight was unknown in 68.5%. Sensitivity and specificity were not calculated for these clinical variables. OGCT using a threshold of 140mg/dL had Se 64.3%, Sp 67.8%, PPV 13.2% and NPV 96.1%. Urine dipstick (positive or negative) had Se 14.3%, Sp 92.9%, PPV 13.3 and NPV 93.4%. FBG using a threshold of 86mg/dL had Se 57.1%, Sp 73.8%, PPV 14.3% and NPV 97.7%. RBG using a threshold of 144mg/dL had Se 28.6%, Sp 98.9%, PPV 66.7% and NPV 98.4 %.

All of the screening tests had lower sensitivities in our study population compared to those obtained by other authors in Caucasians. However, OGCT was a better option among our participants and urine dipstick the worst. A study in a larger sample in order to derive population-specific cut points is therefore warranted.

No conflict of interest

P-1310

Frequency of risk groups in teenagers and young adults identified by the Findrisk survey

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Background: The International Diabetes Federation has established as a first step to prevention of Diabetes the identification of persons at risk through the Findrisk survey. The frequency of teenagers and young adults at risk identified by this survey is unknown in our country.

Aims: Describe the frequency and clinical characteristics of teenagers and young adults at risk to develop Diabetes identified by the Findrisk survey.

Methods: To all Juniors in our University, as part of the admission process a medical exam was performed. A medical history and the Findrisk survey were assessed. Glucose, cholesterol and triglycerides were measured. The students were categorized according to the score obtained through the survey as: low risk: (0 to 6 points) slightly elevated (7 to 11 points), moderate (12 to 14), high (15 to 20) and very high (>20 points). Clinical characteristics and laboratory results were compared amongst the groups. The continuous variables are described as mean ± SD and the categorical in percentage. The T and Chi-squared tests were used any place where needed, as well as the lineal correlation analysis between the continuous variables.

Results: 698 students were studied (female n=396, 56.7%), mean age 18.4±1.12 years, the frequency of the groups was: low risk 75.1%, slightly elevated 21.3%, moderate 2.6%, high 1% and very high 0%. There were no differences in the frequency of groups among sexes. The mean of points was: 4.85±3.27, 5.16±3.23 and 4.45±3.28 in total group, female and male respectively (p<0.05 women vs men). We found a positive correlation (p<0.05) between the total amount of points and the cholesterol and triglycerides levels (not the glucose), the main difference was at the point of comparing the groups of low and moderate risk (triglycerides 96.41±47.04 vs 165.5±106.85 mg/dl, cholesterol 161.34±27.14 vs 183±39.8 mg/dl, p< 0.05 in both). We found a statistically significant difference when comparing the frequency of hypertriglyceridemia among the groups of low and moderate (11.1% vs 44.4% p<0.05).

Discussion: Our results show that even though in stages considered of low risk, patients that should undergo a thorough scrutiny in search of diabetes and disorders of glucose tolerance can be found. Also, we found a statistically significant correlation between the score of the survey and the cardiovascular risk factors such as hypertriglyceridemia and hypercholesterolemia. The increase in the frequency of elevated triglyceride we believe is related to insulin resistance that is certainly present in students with a higher score

No conflict of interest

P-1311

Diabetes risk questionnaire: results of online survey

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There are some 500 000 people with diabetes in Serbia. The new National Strategy Program for Early Detection of Diabetes type 2 was officially announced in 2008. A Diabetes Risk Questionnaire was placed on the web site of the Diabetes Association of Serbia, www.diabeta.net.
The aim was to analyze the frequency of Questionnaire usage, type of people concerned about diabetes and incidence of high risk for diabetes.
Methods: The Questionnaire was placed on the web site in September 2008. Analysis was done on 27th March 2009.
Results: The questionnaire was filled by 1458, but only 1226 were valid. Interest was mostly shown by participants younger than 45 years of age (776 -63.3.%), than by the middle aged (45/54 years, 242 – 19.7%), older (55-64 years, 172 – 14%) and least by elderly people (>64 years, 36 – 3%). Obese individuals were the ones mostly concerned (1215 - 99.1%). Waist circumference (WC) was measured and 487 participants (39.7%) reported having normal WC, according to the IDF criteria. Some 434 (35.4%) participants had WC 94-108cm for male and 80-88cm for females. Waist circumference greater than 102cm (male) or 88cm (female) was present in 305 (25.3%). Recreation for at least 30 minutes, walking included, was practiced by 743 (60.6%) participants. Fruit and vegetables was consumed every day by 797 (65%) of subjects. Antihypertensive therapy was used only by 27.2% of subjects. A blood glucose measurement was never performed in 695 (56.7%) of subjects. Family history was present in 57% of participants, with 37% having diabetes in first line relatives. Risk calculation revealed that 180 subjects (14%) had low risk for diabetes. It was slightly elevated in 387 (31.6%) and considerably elevated in 248 (20.2%) of subjects. High risk for diabetes was discovered in 336 subjects (27.4%),while very high risk was present in 6.1%.
Conclusion: Diabetes Risk Questionnaire was approached mostly by younger people, familiar with internet usage, who considered themselves obese and had positive family history. Waist circumference measurement can be imprecise in obese subjects. Blood glucose testing should be motivated in younger subjects. Questionnaires on diabetes related web sites are a good method of discovering individuals with risk for diabetes.

No conflict of interest

P-1312

Evaluation of diabetic patients treated in first and second degree medical centers: first survey report of north-west region of Turkey

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Aims: In order to prevent the development of diabetic micro and macrovascular complications, all metabolic parameters and blood pressure levels should be in target ranges. In any level, all clinicians should be treating their patients dynamically.
Methods: Canakkale University Faculty of Medicine was founded five months ago and it is the first education hospital in north-west of Turkey. We wanted to assess the condition of diabetic patients admitted to our endocrinology and metabolism outpatient clinics who had been followed by general practitioner or second level hospitals in our city previously. Five hundred (male=235; 47% and female=265; 53%) type 1 (n=35; 6,9%) and type 2 diabetic patients (n=465; 93,1%), were evaluated for the metabolic parameters, hypertension, dyslipidemia, micro and macrovascular complications.
Results: Treatments of the patients were as follows; only diet (n=35; 7%), oral anti-diabetics (OAD) (n=330; 66%), only insulin (n=40; 8%), and combination of insulin and OAD (n=95; 19%). Only a few patients with type 1 (n=6; 17%) and type 2 (n=68; 14.6%) diabetes had reached the HbA1c target of lower than 7%. Target blood pressure level of <130/80 mmHg was achieved in 25 (71%) type 1 and 102 (35%) type 2 diabetic patients. In the whole group, LDL-cholesterol<100 mg/dl and HDL-cholesterol >45 mg/dl levels were achieved in only 95 (19%) and 120 (24%) patients, respectively. Type 2 diabetic patients were mostly obese (BMI>30 kg/m2) (n=354; 90%). Microvascular complications were observed in 220 (44%) patients. In this group, retinopathy (n=77; 35%), neuropathy (n=103; 47%), and nephropathy (n=18; 40%) were present as microvascular complications. Also macrovascular complications, cardiovascular disease (n=100; 20%), peripheral vascular disease (n=25; 5%), and stroke (n=10; 2%) were determined.
Discussion/conclusions: Diabetic patients who were treated and followed by first and second line heath care centers, had uncontrolled diabetes (86,4%), uncontrolled hypertension (75%), hyperlipidemia (81%), obesity (90%), and almost half of them had at least one of the microvascular complications. Clinicians in first and second line medical centers follow more diabetic patients than medical schools and professional diabetes centers. Educational programme targeted to these clinicians should be increased and they must be encouraged to use more dynamic and new treatment modalities for their diabetic patients.

No conflict of interest

P-1313

Sixty-second screening identifies persons at risk for diabetic foot ulcers

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Aim: To develop and apply a low-tech screening tool for risk status of developing diabetic foot ulcers in a resource-poor setting.
Methods: The 60 second screening tool identifies high risk status on the basis of history, examination of the foot for lesions or deformity, monofilament loss of protective sensation, joint stiffness and the absence of a pedal pulse. The tool was applied in a weekly medical diabetic clinic at Georgetown Public Hospital Corporation, (Guyana's only referral and teaching hospital). The clinic has a population base of more than 2000 patients. High risk status was defined as a single positive score on the tool. Identified high risk patients were referred to the Diabetic Foot Centre for further assessment to prevent foot ulcers through patient education and the supply of appropriate footwear and orthotics.
Results: Audit of initial screened1000 patients: 70% of screened population is female; 40% of total screened population is at high risk; 13% had previous ulcers; 5% previous amputation; 8.5% an absent foot pulse; 7.7% an active ulcer. The tool profiles the frequencies of risk factors in the population. Inter- and intra-rater reliability of the tool will be presented. High risk patients referred to DFC form a cohort to determine the effects of patient education, follow-up concerning foot care and the wearing of appropriate footwear on ulcer prevention.
Discussion/conclusions: Screening of people with diabetes for high risk status is an essential component of comprehensive diabetes care. It focuses preventive practices and reduces workload for the treatment of foot ulcers and their complications. It also identifies unrecognized ulcers at an early stage. Screening and patient education to change behaviors are the keys to preventing diabetic foot ulcers. The 60 second tool has been adopted by the Ministry of Health in Guyana.

Conflict of interest:
Employee: M.G. Rambaran, Georgetown Public Hospital Corporation

P-1314

Family history is strongly associated with diabetes in the mixed ancestry population of Cape Town, South Africa

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Background and aims: Diabetes has been recognized as a global epidemic with its prevalence increasing at a rapid rate both in developed and developing countries. The mixed ancestry population has been shown to have one of the highest incidence of diabetes in South Africa. A positive family history has been hypothesized to be a significant risk factor in the development of type 2 diabetes. The objective of the study was to determine factors that may contribute to the high prevalence of diabetes in the mixed ancestry population of South Africa.
Methods: In a cross-sectional study, 600 subjects within the age group of 35-65 years who were randomly selected through multistage random sampling within the Bellville South area of Cape Town underwent an oral glucose

tolerance test. Diabetes, IGT and IFG were determined using the revised WHO criteria. Subjects underwent several anthropometric measurements and demographic, family, health, lifestyle data were extrapolated by use of a questionnaire. Smoking and alcohol consumption were assessed by means of a questionnaire. To validate subjects' responses, urine cotinine and serum GGT levels were measured for tobacco and alcohol consumption.

Results: Overall the crude prevalence of diabetes was 25.6 % of which half were newly diagnosed whilst the other half were self reported diabetics. IGT was present in 4.0% whilst IFG was in 3.5%. Self-reported smoking correlated with urine cotinine levels. Though alcohol consumption was significantly higher in females, gamma-GT levels of males were significantly higher than females, $p< 0.05$. Only 5.1% of individuals with a family history of diabetes did not have either diabetes, IFG or IGT. Females were significantly more obese than males in all age groups 35-45, 46-55 and 56-65, $p=0.002$ and 0.000 and 0.031 respectively. 57% of diabetic individuals were obese whilst 27.6% were overweight. In a multinomial logistic regression analysis that adjusted for factors such age, sex, family history of diabetes, nicotine and GGT levels, weight and lipid levels, the father's family history of diabetes was strongly associated with the development of diabetes (odds ratio = 2.092, 95% CI 1.109 – 3.949, $p = 0.023$). HDL cholesterol levels and younger age were negatively associated with diabetes.

Conclusions: Our results suggest that there has been a sharp increase in the prevalence of diabetes with many being undiagnosed. In view of the strong association between a positive family history and the number of undiagnosed diabetics it is suggested that screening for diabetes, particularly in those with a positive family history, at each and every primary health care visit, may result in earlier treatment thereby controlling diabetic complications.

No conflict of interest

P-1315

Diabetes screening in Thai community drugstores: effectiveness, unit cost and provider payment method

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Diabetes Mellitus (DM) is a crucial health problem in Thailand. More than 60% of people with high risk diabetic factors in community are not aware about diabetes and have never been screened. Drugstore as a primary care provider that is stood close to the community could enhance their disease awareness and increase the diabetes screening coverage.

This cross-sectional, descriptive study is aimed to study the effectiveness of diabetes screening in community drugstores and to investigate unit cost and to propose the rational provider payment method for screening service. 11 accredited community drugstores in three provinces: 3 in Nakorn Ratchasrima, 6 in Khon Kaen and 2 in Maha Sarakham were followed during October 2008-February 2009. People aged more than 35 years, indentified as the risk person were screened. Unit cost of the diabetes screening was investigated in provider perspective, including labor cost, material cost and capital cost.

Total of 1663 people aged more than 35 years were screened for their diabetes risk factors. A drugstore could screen average 30-60 cases per month. 9% with high risk factors were referred to the community medical units (CMU) for checking their fasting blood sugar and seeing physician for early diagnosis. During screening, people were informed about diabetes and its sign and symptom and given the leaflets by community pharmacist. Unit-cost of a diabetes screening was 41 Baht per service (1.16 USD) composed of 37% of labor cost, 58% of material cost, and 5% of capital cost. The rational payment mechanism for screening service in accredited drugstore is fee-for-service with 41 Baht per service. Drugstore could reimburse money from the budget of promotion and prevention community-based services (P&P-COM budget). This budget is managed by the contracting unit for primary care (CUP) of National Health Security Office (NHSO) which organizing the Universal Coverage Scheme in Thailand.

It can be concluded that diabetes screening by pharmacist in the accredited drugstore could promote community awareness on diabetes and support the coverage of screened people with risk factors. Community pharmacist as a primary care provider could reimburse his money with the rational payment that could increase their incentives to provide the service.

No conflict of interest

P-1316

Organisation of seamless and reliable management of diabetic retinopathy screening through teleophthalmology

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Aims: Teleophthalmology for screening for diabetic retinopathy (DR) has shown significant visual health results and savings of medical resources in urban and remote communities. Although data and image capture and their electronic transfer are relatively straightforward, management and overview of the screening process are necessary to monitor and ensure quality of all steps, from creation of appointments to follow-up with an ophthalmologist and yearly patient recall.

Methods: Management tools are needed to ensure retrieval of any scheduled patient who has not followed on examination, prompt interpretation of data by the ophthalmologists with an automated redistribution towards other ophthalmologists when delays for interpretation are not met, to flag amongst a large volume of patients any diabetic presenting with a condition dictating intervention or surveillance. Overviewing of timely and appropriate follow-up for each screened diabetic as well as quality control of the medical diagnostics are also needed. Any screening program must ensure security and confidentiality, easy management of protected levels of access for specific tasks for imagers, ophthalmologists, computer technicians, administrators as well as tracing of all actions to all individuals who intervene. Continuing care needs be ensured by systematic transmission of screening results to medical doctors involved in the care of the diabetics and by feedback to and recall of screened diabetics. Organized and easily retrievable data for public health analysis providing a prospective DR registry is also pertinent. Management tools need be compatible with any camera used for screening and be usable in conditions with no immediate access to internet. Using specially developed software with all of the above characteristics, screening for DR through teleophthalmology has been performed since 2005 in urban, semi urban and remote communities in over 8,000 diabetics through mobile and permanently located cameras, with and without immediate access to internet.

Conclusion: Such management software permits easy overview and reliable, safe management of patients screened for DR, monitoring every step of the screening process from the creation of a screening appointment to follow-up with an ophthalmologist to yearly patient recall while ensuring quality control and access to epidemiological data. It could be advantageously used in any public health care screening program for DR.

Conflict of interest:
Stock ownership: Developer and owner of Laboratoires de la Rétine RD, company providing telemedical screening for diabetic retinopathy

P-1317

High prevalence of metabolic syndrome in a group of hypertensive patients in Haiti

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Aims: The prevalence of arterial hypertension is high (47%) among people aged ≥ 20 years in the metropolitan area of Port-au-Prince, according to a previously published study. Hypertension is one of the main components of the metabolic syndrome (MS). A high frequency of MS in hypertensive patients can strongly suggest a high prevalence of this syndrome in the same population. The purpose of this study is to evaluate the prevalence of MS and to analyze the relationship between its components among patients of a hypertension outpatient clinic in Port-au-Prince.

Methods: A total of 119 consecutive hypertensive patients referred to the hypertension clinic, over a period of 3 months, were assigned to the study group. Hypertension was defined as Blood Pressure ≥ 140/90 mmHg or treatment of previously diagnosed hypertension. Demographic data and anthropometric measurements were collected. Fasting blood glucose and lipid profile were performed by venous sample for each participant. Metabolic Syndrome was defined using the IDF criteria.

Results: Mean age was 58.0 ± 11.6 years, with 77.3% women. Median duration of hypertension was 4 years, and all the patients were receiving oral medications. MS was found in 64.7% of these hypertensive patients. In 74.8% of the patients, hypertension was associated with at least 2 factors of MS. A total of 78 (65.5%) hypertensive subjects had also abdominal obesity and only 1 patient with abdominal obesity did not have MS. In patients with MS, 80.5%

had 4 of the 5 diagnostic components, and the frequency of the components associated with abdominal obesity and hypertension was: reduced HDL cholesterol (97.4%), raised fasting glucose (79.2%) and raised triglycerides (27.7%).Furthermore, 81.5% of hypertensive patients with reduced HDL cholesterol versus 11.1% with normal HDL cholesterol have also abdominal obesity (p<0.001). Logistic regression showed that reduced HDL cholesterol was independently associated with abdominal obesity (p<0.001).

Conclusions: Our study showed a high prevalence of metabolic syndrome in a group of hypertensive patients in Haiti. This finding associated with the known high prevalence of hypertension in urban Haitian population illustrates the need for screening for MS in hypertensive subjects at initial diagnosis or first medical visit. The very strong association between abdominal obesity and reduced HDL cholesterol in hypertensive patients drastically increases the probability of MS in presence of the combination hypertension and abdominal obesity.

No conflict of interest

P-1318

Risk factors for diabetes in Romani population in Serbia

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It is well known that Romani people suffer from respiratory and cardiovascular diseases. It is very possible that they have high prevalence of diabetes, due to the presence of risk factors: poverty, obesity and stress due to frequent and often forced migrations.

The aim of our study was to investigate the risk factors for diabetes in the Romani population in Serbia.

Methods: Diabetes Association of Serbia screened the Romani population for diabetes. Research concentrated on risk factors for diabetes: obesity, knowledge of occurence of diabetes in family members and difference between urban and rural communities.

Results: Some 2015 Romani people were screened for risk factors. Research was done in 11 urban (1130 people) and 8 rural communities (885 subjects). Most subjects (820) were in the age group 31 - 50 years. Slight less were in the age group 51-70 years (631). Least responders were in the age group over 70 years (95) and slightly more in the age group 18-30 years (469). The subjects were subdivided into 4 groups: those with diabetes (87, 5.9%), those with newly discovered diabetes (76, 5.2%), people with borderline blood glucose values (340, 16.9%) and healthy subjects (1450, 72%). Multinominal regression analysis was used to assess the risk for developing diabetes in obese subjects, those with positive family history and those living in urban settlements. Risk for diabetes was 3,48 times higher if a Roma person had positive family history (OR 3.47; 95% confidence interval 2.37-5.1; p<0.01). Obesity was significantly more prevalent in Romani people with diabetes and those with borderline results (X^2=32.555 ; df=3; p<0.01). The risk of diabetes was 2 times higher in obese Roma person than in the non-obese (OR 2.107, 95% confidence interval 1.249 – 3.554; p<0.01). The risk of developing diabetes was 3,649 times higher in Roma people that live in urban settlements (OR 3.649, 95% confidence interval 1.998 – 6.662; p<0.01), compared to rural.

Conclusion: It is difficult to perform screening of Roma people for diabetes. Diabetes should be searched for in those who are obese, have positive family history and live in urban settlements.

No conflict of interest

P-1319

Type 2 diabetes mellitus screening in Kathmandu, Nepal – a pilot study

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Aims: Life-style changes in developing countries cause an increase of obesity and type 2 diabetes mellitus. This in combination with health care insufficiency can have serious health and socio-economic impact. Town areas of Nepal belong to those with the highest prevalence of type 2 diabetes mellitus and impaired glucose tolerance in the world. The aim of the study was the screening for type 2 diabetes mellitus among inhabitants over 40 years old in Kathmandu, Nepal.

Methods: three one day screening points were establihed in different parts of Kathmandu. In cooperation with the local authorities (public notice) inhabitants over 40 years were asked to come for diabetes screening. Fasting plasma glucose, BMI, and blood pressure were examined in all patients.

Resultes: we examined 376 inhabitants (259 woman and 117 men), average age 56,2 ± 9,2 year. Among them there were 45 patients (26 woman and 19 men) with known type 2 diabetes. Among the rest 233 woman and 98 men, there were 32 woman (13,7 %) and 20 men (20,4 %) fulfiling type 2 diabetes mellitus criteria (fasting glucose over 7 mmol/l) with average value 10,3 ± 2,3 mmol/l. Frequence of hypertension was significantly higher in patients matching diabetes criteria (20,1% vs. 42,8, p< 0,05), also BMI was significantly higher in this group (25,9 ± 2,2 vs. 1,7, p<0,05).

Conclusion: A method of screening points offers an efficient method of type 2 diabetes screening in Nepal. Our results correspond with previously reported high prevalence of type 2 diabetes in town areas of Nepal.

No conflict of interest

LIVING WITH DIABETES

Primary prevention

P-1320

Healthy children, physical activity and the relation to blood glucose, C-peptide and BMI

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Aims: The incidence of type 1 diabetes among children is increasing. This increase could be related to environmental factors such as low physical activity and overweight/obesity among children. The aim was to study if lack of physical activity relates to blood glucose value and insulin sensitivity in healthy children. Another aim was to study if low physical activity is related to overweight/obesity in children.

Methods: As a part of the prospective study 'All Babies In southeast Sweden' (ABIS), 199 children 8 years old participated in this particular study. Weight, height and pedometer steps were registered. The parents answered questionnaires and blood samples were gathered.

Results - The fewer daily steps the child was taking correlated to higher BMI (Body Mass Index) (P= 0.019), to bigger waist circumference (P=0.018) and also to higher fasting serum C-peptide (P= 0.044), HOMA IR (P=0.046) and HOMA ß-cell (P=0.022). The more hours/day the children spent in front of TV/video, the bigger waist circumference (P= 0.033) and higher fasting blood glucose values (P=0.016) they had.

Discussion: When measuring physical activity, it was found that lower physical activity is associated with higher BMI and bigger waist circumference. It was also found that children who were more physically inactive spent more time in front of TV/video. Those with low physical activity measured by step counters also had higher fasting C-peptide and increased HOMA IR index which indicate insulin resistance.

Conclusion: A lifestyle with higher energy intake and low levels of physical activity may in fact already at these low ages increase the ß-cell stress and could, according to the ß-cell stress hypothesis, contribute to an increasing incidence of type 1 diabetes in children.

Conflict of interest:
Advisory board: Dr Anders Raustorp has served as medical advisor for Keep Walking Scandinavia AB. KWS is a company in the wellness sector with online consulting, online distribution of literature and online distribution of pedometers of different brands including the Yamax. To our opinion this has by no means affected the result of this study.
There does not exist any other potential conflict of interest.

P-1321

Cholesteryl ester transfer protein activity and components of the metabolic syndrome in school children

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Background: Cholesteryl ester transfer protein (CETP) transfers cholesteryl esters from HDL toward lipoproteins of lower-density classes in exchange for triglycerides, enabling the transport of HDL-derived cholesteryl esters back to the liver via VLDL and LDL
Objective: To determine the association of CETP with components of the metabolic syndrome such as BMI, waist circumference (WC), blood pressure, glucose, insulin and lipid levels in children.
Methods: Data were collected cross-sectionally from an elementary school in November 2008. BMI, WC, blood pressure, and Tanner stages were obtained. Fasting levels of lipids, insulin, glucose and CETP activity (radiometric assay) were determined. To measure the strength of association between two variables, a Spearman correlation coefficient was used. Separate linear regression analyses were done using variables with significant relationships in spearman analysis, as dependent variables and CETP, age, and sex as independent variables.
Results: Fifty eight children (31 males) aged 9.0±2.5 y were evaluated. Seven (12.1%) of the children were obese (>95th percentile), and 9 (15.5%) overweight (85-95th) as CDC guidelines. Most of the children (64.9%) were pre-pubertal (TS1: 37/58). There was a higher activity of mean CETP in obese (190.35±39.14%/ml.min) than in overweight (172.71± 27.27) and normal children (137.12±41.11). Spearman correlation showed an inverse association between CETP and HDL-C (r=-0.31;p=0.018), but a positive association between CETP and BMI (r=0.36;p=0.007), WC (r=0.35;p=0.007), total cholesterol (r=0.41;p=0.001), LDL-C (r=0.48;p<0.001), insulin (r=0.35;p=0.007), and HOMA-IR (r=0.32;p=0.02). In contrast no significant correlation was found between CETP and systolic blood pressure, glucose and triglycerides. In separate linear regression models, CETP was independently associated with BMI (B= 0.03; p=0.002) ; WC (B= 0.09; p=0.002) ; HDL-C (B= -0.066; p=0.017) ; total cholesterol (B= 0.32; p=0.001) ; LDL-C (B= 0.25; p<0.001) ; HOMA-IR (B= 0.006; p=0.003) and insulin (B= 0.03; p=0.002) adjusted by sex and age.
Conclusions: Increased CETP activity was associated with higher BMI, WC, total cholesterol, LDL-C, and insulin and with lower HDL-C in school children. These findings suggest that CETP activity might increase the risk of future cardiovascular disease in children. Additional longitudinal studies should be done to further confirm these findings.

No conflict of interest

P-1322

Obesity and overweight among students as risk factors for metabolic syndrome

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Aim: to assess the frequency of body weight disturbances among students; analyze the main lifestyle factors: the level of physical activity and eating behavior; evaluate the presence of insulin resistance in students with and without obesity.
Methods: The study included a questionnaire survey concerning the level of physical activity (International Physical Activity Questionnaire – IPAQ) and diet (special developed questionnaire), an assessment of anthropometric measurement (BMI, waist-to-hip ratio) and blood pressure. Laboratory research was conducted to evaluate insulin resistance in the selected groups with normal body weight and obesity. Insulin resistance was evaluated based on the index HOMA-IR (normal value up to 2.77) with the determination of fasting glucose level and fasting insulin level (enzyme-linked immunoelectrodiffusion essay).
Results: The study included 400 students of Belarussian State Medical and Pedagogical Universities, 86.2% female and 13.8% male, mean age 20.46±1.77 years. Among all examined students 12.5% were found to be overweight (BMI 25-29.9 kg/m^2), 3% - obese (BMI >30 kg/m^2), 13.5% had the deficit of body mass (BMI <18.5 kg/m^2). High waist-to-hip ratio was found in 3%; arterial hypertention (≥140/90 mm Hg) in 5.8% of the students. Students eating behaviour was found to be unregular (only 16.75% of the students eat 4 or more times a day, 87% of students have frequent unhealthy snacks), poor with excessive consumption of carbohydrates and low consumption of fruits and vegetables, despite the presumable awareness of these groups of students about the importance of healthy lifestyle. Analysis with the IPAQ survey showed that 19.5% of students had a low level of physical activity, 65.25% moderate, and only 15.25% of students had a high level of physical activity. There was a significant difference between groups (obese students – 3.16±0.67, normal body weight – 2.33±0.32, p=0.008). 66.7% of the students in the obese group had insulin resistance based on HOMA-IR index. These students are at high risk of development of diabetes mellitus and cardiovascular diseases.
Conclusion: Considering the fact that lifestyle habits are established at young age and have a great influence on future health, there is a need for a comprehensive program on the modification of lifestyle among students, consisting of advice on diet and physical activity to sustain good health. Special attention should be paid to the population of obese young people to prevent the development of diabetes mellitus and cardiovascular diseases.

No conflict of interest

P-1323

Glycemic profile of prediabetic outpatients after nutrition intervention in São Paulo, Brazil

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Guidelines regarding nutrition therapy to prevent diabetes and its complications are imperative in developed and underdeveloped countries.
Objective: to evaluate glycemic profile in prediabetic outpatients after nutrition intervention.
Methods: data were collected from patients entering the Nutrition Ambulatory from the Nutrition Unit – Department of Preventive Medicine – Federal University of São Paulo between 2007 and 2008. Information was obtained through patients´s records containing the results of fasting blood glucose tests. There were selected only patients under the criteria of prediabetes (American Diabetes Association, 2008) and who had at least 1 blood glucose test result 1 year prior to nutrition intervention and another one within 7 months after nutrition intervention. When entering the nutrition ambulatory patients received general nutrition guidelines and an individualized plan aimed at prediabetes treatment and prevention of comorbidities.
Results: from February/2007 till October/2008 373 patients entered the nutrition ambulatory and 9.65% (36) were diagnosed as prediabetics. Age range was 21 to 70 years and 23 women and 13 men had pre-intervention fasting blood glucose (FBG) result and at least 1 FBG result up to 7 months after intervention. It was observed that from the overall patients 75% (28) showed reduction in the glycemic profile after intervention and 56.14% reached normal levels of fasting glucose.
Conclusion: general and individualized nutritional intervention in prediabetic patients shown to be effective in the reduction and normalization of glycemic profile, helping to prevent complications due to prediabetic state development.

No conflict of interest

P-1324

Overweight and obesity in students – risk for metabolic syndrome in adults

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Background: Incidence of overweight during childhood is reaching higher levels in the recent years in Bulgaria. Different studies observe an interrelationship between this problem and the appearance of metabolic syndrome in later age.
Aim: To assess incidence of overweight and obesity among students.
Subjects and methods: 274 boys and 209 girls aged 8 to 15 years have been examined. We used Cole's criteria about classification of overweight and obesity, approved in 2000. Questionnaires, prepared especially for the study, show the physical activity and the eating habits of the students.
Results showed overweight at 12,81% and obesity at 7,25% among the examined students. 9,18% of them have increased arterial pressure. In most of the cases these are children with overweight or with obesity. The results revealed diminished physical activity and unhealthy eating habits among more than 50% of the students.

Conclusions: There are strong enough arguments for serious recommendations what concerns the physical activity and the eating habits of the teenagers. The achievement of this goal probably could help for the prevention of the metabolic syndrome in later age.

No conflict of interest

P-1325

Diabetes and primary healthcare setting: referral and first responsibility in developing countries

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Aim: Diabetes patients usually come to primary health care setting in their first visit. Usually these patients never aware about diabetes information. To analyze the general clinical characteristics of a population of type 2 diabetic patients referred from primary health care to higher center.
Methods: The study was carried out in the last 132 patients referred from primary health care setting. Consideration was given to: age, gender, time since diagnosis, body mass index, glycosylated haemoglobin, diagnosed hypertension, hypercholesterolaemia, ischaemic heart disease and treatment prior to referral. SPSS software was used for the statistical calculations.
Results: Of the 130 patients seen, 62 were female and 68 male. Mean age: 66.73 ± 11.60 years (range 28–87). Mean time since diagnosis: 9.95 ± 9.34 years (range 0–40). HbA1C: 8.20 ± 1.99% (range 4–16.20). BMI: 30.59 ± 5.56 kg/m2; (range 19.7–60), with 13.4% presenting normal weight, 38.4% overweight, 29.6% grade I obesity and 18.5% obesity with a BMI in excess of 35. On the basis of the ATPIII criteria, 70.8% presented hypercholesterolaemia and 65.4% hypertension. Ischaemic cardiopathy was seen in 12.3%. Only 5.6% were referred just after diagnosis without treatment;13.1% were on a diet, 53.5% took oral antidiabetes drugs (10.7% on acarbose, 46.4% on sulfonylureas, 25% with sulfonylureas and metformin, 10.7% on metformin, 7.1% on acarbose and sulfonylureas and none was receiving glitazones or meglitinides), 13.6% were on insulin and 14.1% on insulin and metformin.
Conclusions: (i) Type 2 diabetic patients referred from primary health-care are patients in advanced middle age, with a long mean time from symptoms until they are referred to the higher center, with a clear dominance of overweight and obese patients with poor metabolic control and added cardiovascular risk. (ii) It is important to stress early and continuing education in diabetes, the basis for medical treatment, promoting physical exercise and appropriate eating habits for each patient in order to lose weight and try to diminish from the outset their insulin resistance, promoting also the use of oral antidiabetes drugs capable of preserving the beta function of the pancreas. (iii) These results leads to thoughts on who should direct treatment of type 2 diabetes from its outset, as the start of therapy is the basis for less exhaustion of the pancreatic function and the degree of glycaemic and metabolic control from the moment of diagnosis is going to avoid, or delay as far as possible, the development of microvascular and macrovascular complications.

No conflict of interest

P-1326

Obesity and the metabolic syndrome in developing countries: how it related with diabetes

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Aim: Prevalence of obesity and the metabolic syndrome is rapidly increasing in developing countries, leading to increased morbidity and mortality due to type 2 diabetes mellitus (T2DM) and cardiovascular disease.
Methods: Literature search was carried out using the terms obesity, insulin resistance, the metabolic syndrome, diabetes, dyslipidemia, nutrition, physical activity, and developing countries, from PubMed from 1966 to December 2008 and from web sites and published documents of the World Health Organization and Food and Agricultural Organization.
Result: With improvement in economic situation in developing countries, increasing prevalence of obesity and the metabolic syndrome is seen in adults and particularly in children. The main causes are increasing urbanization, nutrition transition, and reduced physical activity. Furthermore, aggressive community nutrition intervention programs for undernourished children may increase obesity. Some evidence suggests that widely prevalent perinatal undernutrition and childhood catch-up obesity may play a role in adult-onset metabolic syndrome and T2DM. The economic cost of obesity and related diseases in developing countries, having meager health budgets, is enormous.
Conclusions: To prevent increasing morbidity and mortality due to obesity-related T2DM and cardiovascular disease in developing countries, there is an urgent need to initiate large-scale community intervention programs focusing on increased physical activity and healthier food options, particularly for children. International health agencies and respective government should intensively focus on primordial and primary prevention programs for obesity and the metabolic syndrome in developing countries.

No conflict of interest

P-1327

The influence of adipocytokines, muscle and hepatic lipid content on insulin resistance in Japanese

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Introduction: Recently, the prevalence of type 2 diabetes mellitus is increasing in Japan. Some studies has demonstrated that a reduction in the blood adiponectin concentration, an increased production of adipocytokines which induces lipotoxic effects, an excessive accumulation of muscle and hepatic lipid contents and increased visceral fat were all risk factors for type 2 diabetes. Although those factors induced insulin resistance, it is unclear precisely which factor most strongly influenced insulin resistance. This study investigated which factors most strongly influence insulin resistance.
Methods: Thirty-eight obese Japanese subjects (19 males, 19 females; age 40 -75 years) who demonstrated risk factors regarding the diagnostic standards of the Japanese committee on MS. The percentage of whole body fat was measured by the underwater method. Computed tomography was determined to evaluate the abdominal fat area (visceral fat area (VFA) and subcutaneous fat area (SFA)) and low-density muscle area (LDMA) and liver fat (LF). All subjects underwent blood examinations after fasting for 12 hours.
Results: GIR/I significantly correlated with the fat mass (FM) ($r = -0.56$, $p<0.05$), VFA ($r = -0.60$, $p<0.01$), LDMA ($r = -0.69$, $p<0.001$), LF ($r = 0.59$, $p<0.01$). FM significantly correlated with VFA ($r = 0.48$, $p<0.01$), SFA ($r = 0.83$, $p<0.001$), LDMA ($r = 0.82$, $p<0.001$). VFA significantly correlated with LDMA ($r = 0.42$, $p<0.01$), LF ($r = -0.51$, $p<0.01$), but the correlation between LDMA and LF was not significant based on the results of a stepwise regression analysis which was performed with GIR/I as the dependent variable and with FM, VFA, SFA, LDMA, LF as the significant independent variables. LDMA was adopted in Step 1 ($R^2 = 0.42$, $p=0.002$), LF also was adopted in Step 2 ($R^2 = 0.60$, $p<0.001$). In addition, it's performed with GIR/I as the dependent variable and with high-molecular-weight adiponectin, TNF-a, PAI-1, leptin, IL-6 as the significant independent variables. According to these results, PAI-1 was only adopted in Step 1 ($R^2 = 0.29$, $p<0.05$).
Conclusion: The current study indicated LDMA and LF to be closely related with insulin resistance in comparison with the other types of fat distribution. In addition, PAI-1 was also related to insulin resistance. For this reason, both LDMA and LF were confirmed to be important target factors for improving insulin resistance.

No conflict of interest

POSTER PRESENTATIONS

WEDNESDAY 21 - THURSDAY 22 OCTOBER

Diabetes associations

P-1328

Iranian National Diabetes Research Network (INDIRAN) project: background, mission and outcomes

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Aim: Diabetes is a public health disorder that opens important areas of research on prevention and early intervention. Since research without systematic planning dissipates material and intellectual investments, Endocrinology and Metabolism Research Centre (EMRC) developed a national research network and invited local (provincial) research centers in Iran who were active in diabetes surveys to join this infrastructure for research in diabetes.
Methods: Iranian National Diabetes Research Network (INDIRAN) was designed to perform research projects on diabetes in collaboration with research centers throughout the country. This network was formed officially in 2002.
Results: Some considerable outcomes of INDIRAN are: Implementation of Iranian Diabetes Guidelines, arrangement of supporting society for diabetic patients, launching Iran diabetes education website and designing and conducting National projects such as "Diabetes Education and Prevention Program".
Conclusion: We report our qualitative and quantitative findings, the lessons learned from our experience, the obstacles we encountered and future directions.

No conflict of interest

P-1329

International World Diabetes Day activities in Bafang rural area

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Introduction: The Bafang branch of Cameroon Diabetes Association celebrated World Diabetes Day in order to raise awareness about the diabetes pandemic last 13th-14th November 2008 with the global awareness focus of childhood and adolescent diabetes. The crucial point remained on how we could organize a celebration in a society that does not receive allocations and is made up of people that can hardly afford their treatment!
Objectives: Raising awareness among the rural population, screening for diabetes age risk factor and registering new members into the local diabetes association.
Methods: Fund raising for screening materials, Radio announcements, Counselling and free screening (using ADA criteria), March for diabetes, Education.
Results: Fund raising gave us ¤16 instead of ¤229 needed for the organisation. We received 100 strips and 100 lancets for the screening from a local member of the association. Education pamphlets, posters, 1 BP apparatus and 100 lancets were donated by Sanofi Aventis.
We did one week of radio advertisement through the local station plus 2 hours interview. We counselled pupils a day prior to screening test and gave them consent forms for their parents. From primary school, 17 (aged 9-14 years old) pupils responded: 16 had FPG < 100mg/dl, only 1 pupil had IFG between 100-125mg/dl. From secondary school 22 (aged 15-20 years) students responded: majority, 17 (77.27%) had FPG <100mg/dl, 2 (9.09%) had IFG between 100-125mg/dl and 3 (13.64%) had IFG >126mg/dl. From adults, 60 responses of which majority; 16 (48.48%) with FGP <100mg/dl were aged 25-34 years old. Majority, 5 (45.45%) with IFG between 100-125mg/dl and majority, 6 (37.5%) with IFG >126mg/dl were aged 45-54 years old, followed by those aged 55-64 (4 (36.36%) and 5 (31.25%) respectively).
20 people marched; all registered members of the local diabetes association wearing T-shirts with the blue circle "Unite for Diabetes" insignia and slogans of the year's theme.
32 people attended the education session which was presented in the local vernacular and by a film projection.
Feedback/evaluation: We had 8 new registered members: 7 with diabetes and 1 nurse. IFG can be slightly detected among pupils but is common with adult above 45 years old; risk ratio being here 2.92. We need a wider screen to identify the impact of the pandemic among children in this rural area. There is a need for local resources including diabetes education and self-management activities in this rural area and in particular for translation of diabetes education in the local vernacular.

No conflict of interest

P-1330

Georgian Union of Diabetes and Endocrine Associations (GUDEAS), Where are we three years post Cape Town?

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The GUDEAS (foundation year - 1992, IDF membership since 1994) continues its activity. Its mission is "High Quality Diabetes Care / Education and Defense of Rights of People with Diabetes (PWD) in Georgia". A mixed type NGO opens doors to all organizations that share its goals and bye-laws. Past triennium was rather active. One of the most significant activities was UNR campaign, where GUDEAS took active part both internationally (European WG, EEC) and nationally (local Parliament, key persons). This work was quite successful, locally full support was received. In the field of education (PWD and HCPs) our activity has increased: diabetes magazine is published; 7 new guidelines – translated and published; manual on DM in Pregnancy (Georgian/Russian) – published; color book for children with DM translated, passed to MA from EEC; more intensive involvement in medical students and HCPs education; active work with state key persons. In 2007 together with the Ministry of Health of Abkhazia (MoHA) we traveled to Kodori Gorge where we had a symposium for local HCPs and free patient counseling/testing. A branch of the Union was founded, number of its members reached >8000. After August events there are>300 000 refugees; though Georgia managed to go through crises without insulin deficit – all people were receiving the drug. We are working together with local/International charity organizations and MoHA to support these people. New projects/programs are being prepared, some – implemented. Conclusion: Events of the past triennium, both International and local, showed that together we are a great power.

No conflict of interest

P-1331

Training of health care professionals has vast divergences between educating schools in Finland

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Background: Health care professionals who are knowledgeable about the diabetes care process and are skilled in managing the complex needs of persons with diabetes are an important resource for the quality of care. In Finland we don't have enough specialists to serve all the needs of persons with diabetes. Therefore all health care professionals need some basic skills to manage the diabetes care.
Methods: Finnish Diabetes Association observed the situation of diabetes training of various health care professionals during basic and advanced training in Finland. The observing material consisted of web-based survey for schools that educate the professionals, web-based survey for health care labour unions, education curriculums, descriptions of studies, recommendations for health care training and other documents.
The web-based survey was sent to schools which educate the following health care professionals: medical doctor, nurse, practical nurse, podiatrist, dietician, physiotherapist, dental assistant, psychologist, bioanalyst, occupational therapist and pharmacist. Altogether 93 surveys were sent to schools and 61 answers (65%) were received. To health care labour unions we sent 12 surveys and received 11 answers (91%).
Results: We observed that diabetes training of health care professionals varies a lot from both quantity and contents point of view. In training of practical nurses the schools differs most from each other. The quantity of diabetes training varies from 4 hours to 40 hours of education in whole training period. There is significant variation also with dietetics training with various health care professionals.

Conclusion: The quality of diabetes care is in great extent based on training and diabetes-related skills of the health care professionals. The quality of care of persons with diabetes as such is in Finland marked by regional and local divergences. The vast differences in training increases the divergences even more. In order to diminish the divergences, more attention has to be paid to the basic and advanced diabetes training of health care professionals in future.

No conflict of interest

P-1332

Characteristics of cardiometabolic risk factors in patients with type 2 diabetes mellitus in Bulgaria according to the definition for metabolic syndrome of International Diabetes Federation

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The assessment of cardiometabolic risk factors is the first and crucial step to the aim for reduction of cardiovascular risk in patients with type 2 diabetes mellitus (T2DM). The aim of the study was to assess the characteristics of cardiometabolic risk factors in patients with T2DM according to the definition for metabolic syndrome (MetS) of International Diabetes Federation (IDF). Three hundred and eighty three T2DM patients (194 females, 189 males) from different regions of the country, attending Department of Diabetology of the University Specialized Hospital for active treatment in Endocrinology "Acad. Iv. Penchev" of age 62.2±10.4 yr, duration of DM 7.6±6.7 yr, HbA1c 7.5±1.4%, BMI 30.8±4.8 kg/m2 (mean±SD), participated in the study. The presence of the MetS and the assessment of cardiometabolic risk factors were defined applying the definition for MetS of IDF. Metabolic syndrome was established in 76.5% of patients with T2DM (82% females, 70.9% males). Females with MetS were significantly younger than females without MetS and males with MetS were with a significantly shorter duration of DM in comparison to the males without MetS. One hundred and ten of 293 patients with MetS (37.5%) had all 5 components of the MetS. Considering all T2DM patients, the prevalence of central obesity, expressed by the waist circumference, was the same as that of the MetS-76.8%, whereas as an individual risk factor it was present only in 11 of 90 patients without MetS (12.2%). The most common cardiometabolic risk factor, excluding central obesity as a necessary component of the MetS, was arterial hypertension (75.1%). It was at the first position in females with MetS (84.9%) and at the second position in males with metS (63.4%). The prevalence of arterial hypertension in all T2DM patients was 66.3%. Reduced HDL cholesterol was at the second position in patients with MetS (63.5%) and in all T2DM patients (55.4%). It was the most common cardiometabolic risk factor in males with MetS (76.9%). Raised triglycerides were found in 62.5% of the patients with MetS and in 53.7% of all T2DM patients. Combined dyslipidaemia (raised triglycerides, reduced HDL cholesterol) was with the lowest prevalence considering patients with MetS (42.3%) and all T2DM patients (33.9%). In conclusion, T2DM patients included in our study were presented with multiple cardiometabolic risk factors and their cardiovascular prognosis is driven by combinations of these factors which are more potent than expected by their sums. Screening for MetS should be done in all T2DM patients. Treatment of all risk factors is required for reduction of global cardiometabolic risk.

No conflict of interest

P-1333

Dyslipidemia and chronic kidney disease in diabetes mellitus patients, data of an outpatients diabetes care center in Western Romania

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Aims:CKD and dyslipidemia (DL) are highly prevalent in DM patients. DM, CKD and DL are also major risk factors for cardiovascular disease (CVD). This cross section study explores the effects of CKD, DL and CVD on DM patients from an outpatient diabetes survey unit from western Romania.

Method: 646 DM patients (105 DM 1, 441 DM 2), out of 21000 in evidence in a western Romania county have been randomly assigned to the study (349 female, 297 male, average age 57.75 +/- 13.07 years). In the investigated group the average duration of DM was 10.39+/-8.70 years and the average HbA1c was 9.09+/-2.27%. The group was assessed for CVD (i.e. coronary artery disease (CAD), congestive heart failure (CHF), peripheral vascular disease (PVD), history of stroke) and for CKD according to K/DOQI 2002 (GFR was estimated with MDRD 4 formula). Biological data have been retrieved from the centre database. Two-group comparisons were performed using the t-test and the Fisher exact test, as appropriate and correlation have been evaluated with Pearson tests. Data have been processed using SPSS 16.

Results: CKD was identified in 45.51% and DL in 68.13% of DM patients (18.73% hypercholesterolemia, 19.50 % hypertriglyceridemia and 30.34% mixed dyslipidemia). CVD was evidenced in 46,42% of the patients (13.77% CHF, 37.77% CAD, 15,47% PVD and 5.26% history of stroke). The prevalence of CVD was significantly higher in CKD patients as compared to no CKD (CAD 49.65% vs. 27.87%, p<0.0001; PVD 21.08% vs. 10.79%, p=0.0001; stroke 7.14% vs. 3.69%, p=0.018) but the prevalence of DL did not significantly differ in the two groups.

In no-CKD DM patients GFR correlated negatively with age (r=-0.3144, p<0.001), cholesterolemia (r=-0.1844, p=0.001) and BMI (r=-0.1064, p=0.048). The GFR of DM patients with CKD correlated negatively with age, total cholesterolemia (r=-0.1298, p=0.027) and proteinuria (r=-0.1771, p=0.002).DM patients have been divided into four groups (no DL, hypercholesterolemia, hyper triglyceridemia and mixed DL). The highest prevalence of CKD was evidenced in the mixed DL and the highest prevalence of CVD in the hypercholesterolemia group.

Conclusion: DM patients present a high prevalence of CKD correlated with significantly high prevalence of CVD and a high prevalence of DL. We found a negative correlation between GFR and total cholesterolemia, in both CKD and non-CKD diabetic patients. Our results strongly sustain the recommendations of statins use for both cardio and renoprotective purposes.

No conflict of interest

P-1334

Heroes against diabetes in Africa

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Heroes Against Diabetes In Africa was founded in 2008 in the State of New York by parents of a child with diabetes. We understand only too well the joys and sorrows of living with diabetes. Our mission is to foster cross continental commitment to addressing the needs of children in Africa and advocate for effective solutions. We seek to help, design, develop and deliver low cost life saving tools for all in need. This includes access to diabetes supplies and insulin for all.

There are more than 246 million people worldwide living with diabetes, a number that is expected to grow to almost 400 million within 20 years. The African region has not been spared the debilitating and threatening complications of this global epidemic. In developing countries, like Kenya, the prevailing poverty, ignorance, illiteracy and poor health consciousness further adds to the problem. Those who cannot afford or do not have bare minimum health care facilities are likely to be diagnosed late and suffer from diabetes related complications.

Methods: Use a grass root strategy to connect people to people cross continentally and find meaningful solutions to solvable problems.

Support existing medical care facilities and individuals with needed diabetes supplies and insulin.

To rally governments to include diabetes care in their budgets and promote proven low-cost strategies that alter diet, increase physical activity and modify lifestyle.

To encourage sustainable development in developing countries through partnerships, collaboration and outreach.

Results: It is easy to obtain optimum blood glucose control for a patient who has access to diabetes supplies and insulin.

When governments act and include diabetes care in their budgets, lives will be saved and economies will grow. A healthy nation is a wealthy nation.

Sustainable developments will help families with diabetic children to be self reliant. Self reliance creates confidence.

Discussion/conclusion: No child should have to endure the many restrictions and complications of diabetes in a world where the technology and capital to combat the disease. Inspired by the courage of children with diabetes we are committed to building relationships with other organizations to realize this vision.

Lasting progress against the potential diabetes epidemic in Africa will take local awareness and international attention. By promoting powerful partnerships, we will work to increase awareness. We seek to foster a cross-continental commitment to addressing the needs of children with diabetes in Africa and advocate for effective solutions.

Resources:
Africasciencenews.org
STEPwise survey
International Diabetes Federation

No conflict of interest

P-1335

Prevalence of dyslipidemia among individuals participating physical activity-recreational and educational for diabetics

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Introduction: was performed, in the city of Uberaba, physical activity-recreational and educational for diabetics in commemoration of the World Day of Diabetes, during 8 consecutive years. The purpose of this activity was the improvement of conditions of life of these elderly and, consequently the quest for improving the quality of life of these. This improvement is based in the study of the amendments of the metabolism of glucose, lipids and of the co-morbidities and associated complications. The objective of this study was observed the association of diabetes with dyslipidemia among individuals of this gymkhana.
Methodology: performed questionnaire, measured in capillaries fasting glycemia and post-prandial, total cholesterol and triglycerides. Data were analyzed by SPSS 14.0 program and through the chi-square with a significance level of 5%.
Results: 116 persons analyzed, 36 are diabetic (31.0%), 65 (55.6%) has hypertriglyceridemia and 24/100 (24.0%) has hypercholesterolemia. The average statistics – found: age 65.18 ± 1.3 years, fasting glycemia - 112 ± 5.4 mg/dl, glycemia post-prandial - 136, 1 ± 6,8 mg/dl, Body Mass Index (BMI) – 27.1 ± 0.6 kg/m2 SC, waist abdominal – 85.6 ± 1.5 cm, Total cholesterol – 142.9 ± 8.2 mg/dl, triglycerides – 186.20 ± 9.3 mg/dl. There was no relationship between diabetes and hypertriglyceridemia, where 17 People with diabetes have hypertriglyceridemia (28.3 %), and other 17 (34.7 %) with diabetes have normal levels of triglycerides (X2=0.508, p=0.476), nor relationship between diabetes and hypercholesterolemia (X2=2.474, p=0.116).
Conclusion: Through the data found we can infer that it is high index of patients with diabetes and dyslipidemia, mainly hypertriglyceridemia. Thus, we see the importance of adequate nutrition of diabetics, mainly related to lipids, becoming essential the implementation of this type of activity for awareness of the population.

No conflict of interest

P-1336

Diabetes Associations

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Diabetes Associations are a group of persons or a community of people TOUCHED by diabetes. The Diabetes Associations act as the Fire Brigade of diabetes unawareness in our community. The Diabetes Associations commitments are to educate people living with diabetes in respect of daily management of the illness, and to create public awareness to those at RISK by highlighting the immediate warning symptoms of diabetes.
Diabetes Associations brings together type 1 and type 2 diabetes patients, in this regard, they are able to share their individual experience connected to diabetes complications. Through Diabetes Associations, the International Diabetes Federation is able to pass information on recent discovery on diabetes daily management to affected people. Diabetes Associations is a force that can influence an economic intervention of the government to create diabetes centers in hospitals. In Diabetes Associations, diabetes experts and health-care providers can make time outside their routine schedule to give health talks to diabetes patients. Diabetes Associations can mobilize and influence state health policies in respect of drug prices just as the International Diabetes Federation has influenced the U.N to recognize the World Diabetes Day, that diabetes exists and that there is a community touched and living with diabetes.

No conflict of interest

P-1337

A case of a poorly controlled diabetes cured after removal of pituitary adenoma

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A 41 year old gentleman presented to our clinic, in a North-West district town of UK, with uncontrolled diabetes. He was on gliclazide 160 mg bd. He was admitted as an emergency with blood sugar around 27 mmol/l in Congo three years previously and was started on insulin. He persuaded his local doctor in London one year previously to take him off insulin and he was commenced on gliclazide. His random capillary blood sugars were high and his latest HbA1c was 10.7%.
He had strikingly large hands and feet, macroglossia and interdental separation with a BP of 148/102 mmHg. He reported that his hands and feet started to become large 6 years ago. His gliclazide was discontinued and he was commenced on insulin, Humalog Mix 25 10 units bd. Further investigations showed a repeat HbA1c of 11.7%, normal kidney function and calcium level, IGF-1 (Insulin like Growth Factor-1) of 103.7 nmol/l (normal: 8-38) and two high Growth Hormone levels of 79 and 73 mU/l. His pituitary MR scan showed an adenoma (12mmx10mmx8mm). His visual fields were normal. His GAD and islet cell antibodies were negative. His insulin dose was gradually increased and he was referred to a tertiary centre for management of acromegaly.
His GHDC (Growth Hormone Day Curve) showed levels between 45-100 mU/l and the growth hormone level showed no suppression with oral glucose. He was initially treated with somatostatin analogue, Lanreotide injection followed by transphenoidal surgery of the pituitary adenoma, 7 months after his presentation. He remained on hydrocortisone 10/5/5 mg daily and Insulin mixtard 30/70 6 units bd post discharge. With improvement of his blood sugar control, he was able to come off insulin in the next 2 years. He is now on diabetic diet only and his capillary blood sugars range between 4-5 mmol/l.
He presented 4 years later with high BP despite being on ramipril and doxazosin. His urinary catecholamines were normal. However his renin level was undetectable with furosemide (aldosterone of 160 pmol/l and renin activity of < 0.2 nmol/l/hr), but adrenal imaging showed no adenoma or hyperplasia. His general practitioner was requested to prescribe Eplerenone, an aldosterone antagonist.
There are many endocrine causes which can precipitate diabetes such as acromegaly, cushing's syndrome, thyrotoxicosis, glucagonoma and pheochromocytoma. In all cases of diabetes a secondary cause should be looked for. Even a poorly controlled diabetes can be cured if the secondary cause is adequately treated or removed.

No conflict of interest

P-1338

How is individualised care achieved among persons with diabetes in Finland?

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Aims: The aim for diabetes care is to deliver it individualised, continuous and of high quality.
Methods: Finnish Diabetes Association conducted a survey to explore the execution of individualised care in Finland. The survey was web-based and it was sent in Finland to health care professionals who deliver diabetes care. The survey was conveyed by a contact person in every 21 hospital districts in Finland. About 1 000 surveys was sent and slightly over 600 answers (61%) were received. The most answers were from diabetes-nurses (57% of respondents). Other subgroups were medical doctors (29% of respondents) and other health care professionals (14% of respondents), like dieticians, podiatrists and health care leaders.
The individualized care for persons with diabetes was observed by changeability of care. It was asked in survey how often health care professionals assess next activities individually in relation to the needs of the person with diabetes: the

frequency of check-ups, the methods and instruments of care, the instruments of self-care and the combination of specialists who attend the diabetes-care.
Results: 90% of the respondents assess individually the methods of care (98% of medical doctors, 96% of diabetes-nurses and 93% of other professions). 88% of the respondents assess individually the frequency of check-ups. The instruments of care and instruments of self care are individually assessed by 68% of the respondents but only 55% assess individually the need of specialists who attend the diabetes-care.
Conclusions: According to our survey the individualised care is achieved quite well in general outline among persons with diabetes in Finnish health care. Medical doctors seem to have more possibilities than other health care professions to vary activities in question individually in relation to the needs of the persons with diabetes.

No conflict of interest

National and local plans and initiatives

P-1339

Review of practice of referrals from All Wales Diabetic Retinal Screening Service to Tertiary Care Hospital

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Aim: Diabetic Retinopathy (DR) is a highly specific microvascular complication of diabetes and the leading cause of blindness in people under the age of 60 in industrialised countries. It is also a major cause of blindness in older people. After 20 years from the onset of diabetes, over 90% of people with Type 1 and more than 60% of people with Type 2 will have diabetic retinopathy. If detected and treated earlier blindness can be prevented in up to 90% of subjects with DR. To achieve this aim a Diabetic Retinal Screening Service in Wales (DRSSW) was established in 2003. The practice of referral from DRSSW to an ophthalmology clinic in 2003 was reviewed to determine if it met the relevant clinical standards, to establish the appropriateness of the referrals and determine the various outcomes resulting from the referrals over 6 years. An estimate of costing generated by the referrals was also calculated.
Method: Records from 103 randomly selected subjects referred by DRSSW in 2003 to the Ophthalmology Clinic were examined over a subsequent period of 6 years.
Results: Average age of the subjects was 62 years (21-86) with 59 males and 44 females. Of the available data 76 were Type 2 and 21 were Type1. Mean duration of diabetes was 35 years. The referred subjects generated the following over 6 years with total approximate local costing being £ 28736.80

	Number	Cost per unit (£)	Cost (£)
Clinic appointments	561	25.60	14361.60
Fundus Fluorescein Angiogram	30	97.60	2928.00
Optical coherence tomography	3	39.20	117.60
Pan-Retinal Photocoagulation	53	109.60	5808.80
Focal Laser	39	109.60	4274.40
Grid Laser	9	109.60	986.40
Orbital Floor Steroids	1	260.00	260.00
Total Cost			28736.80

12 subjects were discharged back to the DRSSW following the 1st clinic appointment with diagnosis of 'No/Mild Background DR'.The mean interval from screening to referral was 16.65 days with the advised national screening guideline interval being 14 days. The mean interval between referral and the first clinic appointment for proliferative DR was 19 weeks and for pre-proliferative DR was 24 weeks. National Screening Guidelines recommend 2-4 weeks (70-100% referred) and 13-18 weeks (70-100% referred), respectively. Discussion: This study follows approximately 100 patients screened in the first year in which the screening service was set up, in order to enable comparison to be made in future regarding improvement of services. The percentage of inappropriate referrals was ~12% which was within current national standards (8-12%) however the period of referral to review interval fell below national standards, especially for patients with proliferative DR. The limited costing analysis carried out emphasises the importance of screening for diabetic retinopathy for the early treatment of preventable blindness.

No conflict of interest

P-1340

PROCED: diabetes capacity building and community awareness project for Brazilian states and Portuguese speaking countries

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CEDEBA (Diabetes and Endocrinology Referral Center of the State of Bahia, Brazil), a public health center, has been training primary care professionals using Staged Diabetes Management (SDM) customized protocols for the last 10 years. SDM has demonstrated positive outcomes for both improved metabolic control and reduction in complications is a series of studies conducted outside of Brazil.
Aims: 1)To expand CEDEBA's experience with clinical protocols to other Brazilian States and Portuguese speaking countries; and, 2)develop strategies and implementation plans to increase community awareness using diabetes educational tools.
Methods: Health professionals of 7 Portuguese speaking countries and 6 Brazilian States were invited for 5 day training at CEDEBA in November 2008. The Assessment of Chronic Illness Care questionnaire, Version 3.5 (ACIC - MacColl IHI, 2000) was applied to evaluate the local (state) public health care system for each country. Two strategies were established: diabetes primary care training program and public health system management program. Problem based learning strategies and symposiums were used to introduce SDM customized clinical protocols and public health management tools. Educational materials for diabetes self management were also introduced, and a diabetes education event for the community and participants was developed as part of a dissemination process to improve diabetes care and awareness. Participants from each site developed an action plan applying the knowledge built during the course using the protocols and educational tools. E-learning strategies were developed to maintain connection between participants and CEDEBA staff. Follow-up training will occur in 6 months (May 2009).
Results: 50 health professionals (13 physicians, 27 nurses, 5 social workers, 5 dietitians) from 6 States of Brazil (Acre, Alagoas, Bahia, Mato Grosso do Sul, Paraiba, and Tocantins) and 2 African countries (Guinea-Bissau and Mozambique) were trained at CEDEBA and participated in the diabetes education community event. A high grade of satisfaction was obtained from the participants and facilitators self analysis (94%), and all of them were able to develop their local action plans. Advocacy and capacity building actions were included in almost all the plans. CEDEBA education materials, games samples and protocols were offered to facilitate the development of their implementation strategies. Using the e-learning technology the plans have been followed. Outcome data is being collected currently and will be provided as part of the presentation.
Conclusions: Through this project it has been possible to spread the CEDEBA/ Brazil experience on diabetes care at primary heath care level to other Portuguese speaking countries encouraging them to improve local health care and raise awareness on diabetes.

No conflict of interest

P-1341

Knowledge about the risk factors for diabetes and the sources of medical information: A comparison between the Vietnamese and Japanese urban and rural communities

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Aims: Diabetes mellitus along with its complications add to a significant and growing burden on society, especially in Asian countries. To promote effective health management for the prevention and treatment of diabetes, it is important for health professionals to recognize the level of knowledge about the population regarding diabetes and be aware of the sources of such medical information. For this purpose, we conducted a questionnaire study in Vietnam and Japan.

Methods: A cross-sectional questionnaire-based survey was conducted on a randomly chosen population from both the rural (Thai Binh province) and urban areas (Hanoi) of Vietnam. The participants were asked to identify the risk factors for diabetes and provide the sources of their knowledge via multiple-choice questions. Similarly, the community-dwelling Japanese people from urban areas (Tokyo) and Japanese outpatients of International Medical Center of Japan (IMCJ) were surveyed as well.

Results: Subjects from the rural area (N = 155) and urban area (N = 147) in Vietnam, urban area (N = 102) in Japan, and Japanese outpatients (N = 159) completed the questionnaire. The Vietnamese subjects from rural areas, none of whom were diabetic, marked almost all the listed choices (smoking, obesity, excessive salt intake, excessive sweet intake, fatty food intake, excessive alcohol consumption, aging, lack of exercise, and stress) as risk factors for diabetes at similar levels of risk. The Vietnamese subjects from urban area (5.4% were diabetic) considered excessive sweet consumption, obesity, and lack of exercise as the top three major risk factors for diabetes among the listed choices. The Japanese subjects from urban area (5.9% were diabetic) and the Japanese outpatients from our department at IMCJ (73.6% were diabetic) indicated the same choices as that of Vietnamese urban subjects. As for the sources of medical information, medical staff was the most commonly cited source by the rural Vietnamese subjects, and TV and radio were commonly cited sources by Vietnamese subjects from both the rural and urban areas. The Japanese subjects acquired medical information from medical staff and the mass media, including the Internet, rather than from friends and relatives.

Discussion and conclusions: Certain differences were observed in the level of knowledge regarding the risk factors for diabetes between the Vietnamese urban and rural populations but the same could not be said for the urban populations of both countries. The unique results for the sources of medical information in each area provide effective healthcare promotion strategy for the prevention and management of diabetes. These results also lead to the conclusion that information dissemination regarding the modifiable risk factors must be tailored to suit the subjects in each country and residential area.

No conflict of interest

P-1342

The International Diabetes Federation Twinning Initiative – improving diabetes care and increasing awareness of diabetes and non communicable diseases in Mozambique

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Introduction: Despite being the largest cause of mortality worldwide Non Communicable Diseases (NCD) do not receive the attention they deserve in many resource poor settings.

The WHO has called for countries to develop National Plans for NCDs. Mozambique is the first country in sub-Saharan Africa to have such a plan approved and the International Diabetes Federation (IDF) Twinning Initiative has played an important role in achieving this milestone. The support from Diabetes UK assisted in this and also in improving diabetes management and the development of the diabetes association (AMODIA).

Methods: Based on the results of the Rapid Assessment Protocol for Insulin Access (RAPIA) carried out by the International Insulin Foundation (IIF) in Mozambique in 2003, a visit was organised for two members of Diabetes UK to see what type of support could be brought to Mozambique. From this visit the following objectives were established for a 3-year programme of support to Mozambique.

Results: A total of 89 healthcare workers have received training in diabetes and hypertension. 10 out of 11 Provinces now have a team of trained healthcare workers in diabetes management. In addition 2 healthcare workers trained in Tanzania on diabetes education.

These trainings will use patient education material that has been developed locally with input from clinicians, the Ministry of Health and AMODIA. 10 patients have been trained as diabetes educators and will now use this to expand the education sessions.

World Diabetes Day events were organised in both 2007 and 2008. These included information, nutritional advice, exercise sessions as well as measurements of height and weight, for calculation of Body Mass Index, waist circumference, blood glucose and blood pressure. These helped raise awareness of diabetes directly in the community.

The National Plan has now been finalised and integrates cardiovascular disease, hypertension, asthma, diabetes, cancer (breast, cervical and prostate) and trauma and violence.

A research project following a cohort of people with diabetes in Maputo has been initiated in collaboration with the University of Kwa Zulu Natal.

Discussion: With traditional donors to resource poor countries not interested in supporting diabetes projects, the Twinning Initiative provides direct support to developing the capacity of a country to cope with the many challenges of diabetes.

One of Diabetes UK's aims is a "world without diabetes" and the Twinning Project contributes to this aspiration.

No conflict of interest

P-1343

Establishing accessible, effective and well coordinated diabetes care activities in the Regional Hospital Limbe, Cameroon

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The Regional Hospital Limbe (RHL) is a secondary, first referral hospital in the South West Region of Cameroon, one of ten such hospitals in each of the ten Regions of the nation.It has 23 doctors including seven General Practitioners but no internal medicine specialist.

Diabetes care activities are already being carried within the RHL.The individual Doctors, especially the General Practitioners, manage most of the diabetic patients individually in their offices, mass screening and education are done intermittently on special occasions like the World Diabetes Day and the laboratory does routine workup. However, all these activities exist as separate packets of care without any purposeful inter-relation and coordination as a whole. There is no unit within the facility serving as a Diabetes Clinic which is necessary given the size and responsibilities of the RHL, neither is there at the moment a Physician or Paramedical staff solely responsible for Diabetes care. Nevertheless, national policy warrants the existence of the Diabetes Clinic in such a facility, but the hospital has had difficulties establishing one over the past years for multiple reasons probably including poor organization and leadership in this aspect within the hospital.

This project seeks to harmonize, coordinate, supervise and continuously improve diabetes care activities in the RHL which eventually should be centered in a discrete infrastructure within the facility as the Diabetes Clinic. Our approach shall follow a preconceived model of "Phase-Step" designed to establish a functional diabetes clinic in a facility without one but with the necessary capacity. The Phases are the clinical settings of care and the Steps are the major actions to cause a change from one phase to another. Our model has three phases. Phase 1 is our current status in which diabetes care activities exist but are disaggregated and uncoordinated (Disorganized Diabetes Care Activities).Phase 2 is the Virtual Diabetes Clinic which is a transitory phase in which the different care activities within the facility are surveyed, connected, coordinated, supervised and improved using what is available, though no care structures yet dedicated solely for diabetes care. Phase 3 is the target phase of

an established Diabetes Clinic. Step 1 is essentially the leadership, awareness and motivation to create the Virtual Diabetes Clinic while step 2, which leads to the Diabetes Clinic, will consist of setting apart or creating minimal structures solely for diabetes care and effective care processes designed within.
This is a team endeavor that will involve national and international partners and is expected to be realized within 6 months starting April 2009.

No conflict of interest

P-1344

Training course for school personnel: integrating and assisting children with diabetes in school

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In order to facilitate coping with complex psychological and psychosocial needs of children with diabetes, teachers must have basic knowledge about diabetes. At The Departement of Pediatrics, University Hospital Zagreb we developed a systematic educational programme for teachers in cooperation with the Ministry of Education.
Aim: to evaluate the outcome of courses for school personnel in terms of changes in diabetes-related knowledge and attitudes towards children with diabetes.
Methods: The courses consisted of lectures about basic knowledge regarding diabetes, active learning about psychological implication of diabetes in children, practicing skills related to diabetes management and discussion with nurses, paediatrician and psychologist. 348 participants completed two comparable versions of questionnaires before and after the course. One evaluated knowledge about diabetes and the other attitudes toward diabetic children. The participants perception of the importance and applicability and their satisfaction with the course was also evaluated.
Results: Diabetes related knowledge increased significantly after the course and the questionnaire score related to the attitudes toward children with diabetes increased significantly (higher score reflects more positive attitudes toward abilities and potential of diabetic children). All participants perceived the course as applicable, interesting and well organised.
Conclusions: The training course for school personnel is useful in improving diabetes-related knowledge and positive attitudes toward children with diabetes. The course helped participants understand the implications of having diabetes, gave them basic knowledge and skills to manage diabetic children and helped them to feel at ease in accepting these children in the school settings.

No conflict of interest

P-1345

Community based intervention for non-communicable diseased people: an initiative to reach door to door

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Context: In Bangladesh, regardless of significant improvement on mortality rate, still deaths due to chronic diseases are increasing at an alarming rate with 27.3% caused by all NCD's. The prevalence rate is even higher in urban areas than that of the rural settings mainly due to rapid urbanization, migration, and sedentary lifestyle. Realizing the urgency of this issue Eminence has initiated a pilot project in the urban context of Dhaka to address the curative, preventive, and awareness aspects of NCD's.
Aims: The aim of the project was to create awareness about the risk factors of non-communicable diseases through increasing knowledge to change in habitual fact related to dietary pattern, physical activity, cessation of tobacco, and compliance to timely and proper medication among identified NCD patients in urban population with the help of a community based intervention model.
Methods: The numbers of direct beneficiaries are 213 known cases of diabetes and hypertension patients aged between 22 to 82 years identified from 6000 population by a baseline screening. The intervention is given through a community based service system, which is comprised of three components: Satellite Centre, Home Visit, and Awareness Building Campaign.
Results: The baseline study found that only 38% respondents have had the right knowledge (here the word "right knowledge" means that the participant having knowledge on at least one scientifically proven cause for diabetes; such as 'It is a genetically derived disease', 'its cause is hormonal imbalance') regarding the probable cause of diabetes, and only 10% people knew the maximum allowable level of blood glucose. Among Diabetic patients 44% had measured their glucose level within the last three months and more than 80% patients had been practicing prescribed food habit and exercising to control their blood sugar, on the other hand, 60% patient had been depending on oral hypoglycemic agents and another 25% on insulin. After one year of intervention; 57.5% respondents have the right knowledge regarding the probable causes of diabetes and around 45% people know the maximum allowable correct level of blood glucose. Among Diabetic patients 59% had measured their glucose level within the last three months. Around 90% patients had been practicing prescribed food habit and exercising to control their blood sugar, on the other hand, 77.7% patients had been depending on oral hypoglycemic agents and another 30.7% on insulin.
Discussion: The outcome of the intervention shows that community based intervention among known cases of diabetic patients increases the rate of knowledge and compliance among them.
Conclusion: Lessons and challenges learnt from this kind of pilot project could be replicated nationally.

No conflict of interest

P-1346

Clinical pattern of type 2 diabetes in rural Uganda

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During the period of May 2007 through September 2008, one thousand one hundred sixty eight diabetic patients were registered in a total of 20 diabetes clinics in four rural districts of Uganda, located in the North, South, East and Central regions of the country. The clinics were based on a structured diabetes care program and used structured patient clinic files. The clinics were run by registered nurses who had been given four 3-day courses on a detailed curriculum of management of diabetes. Medical officers who had undergone similar training program supervised the clinics, reviewed and managed complicated cases.
The mean age of diabetic patients was 50 years with duration of 3.9 years of diabetes. The mean BMI was 23.3 kg/m^2 at the start of project and not much changed at the end of one year: 23.5 kg/m^2. Uncontrolled hypertension was observed in 34.7 % at presentation, despite majority of patients presenting with hyperglycaemia. The average fasting blood glucose during first week of the patient presenting at the clinic was 13.1 mmol/l, and 12.1 mmol/l after 12 months of follow up.
The main barrier to control of blood glucose was patient acceptability of insulin, as the majority of diabetic patients presented with body wasting and hyperglycaemia and would require insulin therapy for stabilization.
In rural Uganda, diabetes presents at a young age and patients present late when they have severe hyperglycaemia and body wasting. This increases the need for insulin therapy which may not be readily available and acceptable. Programs aimed at improving diabetes care in the rural areas need to have this in the strategic planning and an important aspect in the diabetes education. Peer education programs might overcome this barrier.

No conflict of interest

P-1347

Pharmacist led diabetes clinic in community pharmacies in Croatia

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Aim: to improve health outcomes for patients with type 2 diabetes mellitus and patients suspected of type 2 diabetes mellitus as the main benefit of a pharmacist led diabetes clinic in community pharmacies in Croatia
Methods: screening service – blood glucose screening organised with other health professionals (e.g. nurses) as in Croatia pharmacists are not allowed to take blood samples
patient counselling
- collecting data and counselling patients about the illness and its complications
- referring patients with high plasma glucose concentration to their physicians

- monitoring and setting treatment goals
- glucose meter training

Results: patients with type 2 diabetes as well as patients at risk of type 2 diabetes mellitus were satisfied with the provided care and were willing to cooperate with pharmacists in order to improve their health and quality of life for various reasons: pharmacists are the most accessible health professionals, they work more closely with patients and they are more understanding of their problems and concerns.

We have proved that pharmacists, as the most accessible and most visited health professionals and experts on drugs, have an excellent opportunity to educate and counsel patients as well as monitor their disease, while by doing sequential screening in the pharmacies they can detect a high percentage of patients suspected of diabetes.

Unfortunately, pharmacists do not have an important role in the health care process in Croatia at the moment.

Discussion: Pharmacists must provide new services (e.g. education and consultations) in community pharmacies in Croatia. With this project we have started a new service. The service is very well accepted among patients and also improved clinical outcomes for patients. Therefore we hope this service will be recognised by Croatian Institute for Health Insurance and Croatian Ministry of Health as an important part in the health care process.

No conflict of interest

P-1348

Sweet walk at Brasilia's City Park – health prevention and blood glucose monitoring in a walk guided by diabetes education program

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Diabetes mellitus (DM) affects approximately 6% of the population. Its treatment, morbidity and mortality brings high costs. So, it's important to find ways to guide, incite and contribute to the health care, being the right physical activity very important to the therapy and prevention.

Methodology: To celebrate the World Diabetes Day, this diabetes educational program promoted a guided walk with diabetic people and friends in Brasília on a Sunday morning in November. There were overseers of this same program, collaborators of Diabetics Association of Brasilia, The Health Department of city, the firemen brigade etc. Among curious people, friends and other professionals, 39 diabetics attended the event: 6 children, 22 people in insulin therapy (IT), and 11 not in insulin therapy (NIT). More than 70 capillary glycemia (only for diabetics) were measured.

All of them were oriented about the cares to improve and maintain life quality, and about the benefits and attention in the maintenance of physical activities. There were special activities fo children, and also individual orientation, stretching exercises, walking, exchange of experiences, diabetes reports, lecture about diabetics' rights and tai-chi-chuan. The event lasted almost 4 hours.

Results based on averages of Initial Glycemia of everybody and at the end of the activity the Final Glycemia of who participate of some activities, in mg/dl:

Group	Initial Glycemia in arrival			Initial Glycemia	Final Glycemia
	Average all	Min	Max	Sample Averages	
NIT	171	116	316	172	125
T2 - IT	229	112	301	235	174
T1 Adult	170	068	295	213	155
Children	185	116	248	185	082
Average of all	189	068	316	201	134

There was a great reduction of capillary glycemia among the diabetic people that were there. The glycemia average at the arrival (189±28mg/dl) reduced from 201 ± 28 to 134 ± 40. Usually, higher glycemias were founded among the type 2 in insulin therapy (229/235/174) and the lower among the NIT diabetic people (171/172/125). There was not significant hypoglycemic incident. Everybody was informed and motivated to practice oriented physical activities and to take part in educational programs for diabetes.

Conclusion: These kind of events are very important to improve the attention to diabetic condition and to help people with diabetes, and also to empower the role society about health cares, and mainly to highlight physical activities as a means to bring quality of life and awareness.

No conflict of interest

P-1349

Long-term experiences evaluation of improved glycemic control and metabolic markers in a 7-year diabetes cohort

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Aims: The prevalence of diabetes is increasing at an alarming rate, as are the associated personal and societal costs. Therefore, Shared Care of Network for diabetes was advanced by Department of Health (DOH) in Taiwan to promote the integration of basic medical resources, setup of case management procedure as well as education programs for the public health nurses, and improvement of control in diabetic complications. In this study, we reviewed our care system to evaluate the continuous health instructions are helpful to patients on good control of their glucose level.

Methods: This study is to determine the efficacy of government promoted diabetes education by collecting and analyzing information from a cohort of patients with diabetes who attended diabetes education program of Changhua Christian Hospital between April 2002 and December 2008. The efficacy was evaluated by the fasting blood glucose (BG) and HbA1c levels from outpatients with 7-year follow-up, and other metabolic markers were also monitored.

Results: A total of 749 subjects (348 males, 401 females, 21 type 1, 728 type 2), having an average duration of diabetes of 13.7 years, registered into this educational program. In these patients, HbA1c had reduced by 0.422% (absolute reduction); a relative reduction of 5.55% ($p<0.0001$) between 2002 and 2008. Same trend was found upon fasting blood glucose. When checking other metabolic markers, we found most of parameters like systolic pressure; diastolic pressure, total cholesterol, and triglyceride were gone down during the 7-year period. Statistically significant reductions in systolic blood pressure (133.9-131.1 mmHg, $p<0.0001$), diastolic blood pressure (78.3-74.5 mmHg, $p<0.0001$), total cholesterol (191.9-174.6 mg/dl, $p<0.0001$) and triacyl-glycerol (166.6-144.6 mg/dl, $p=0.0004$) occurred between 2002 and 2008. However, HDL (49.9-52.6 mg/dl, $p=0.00015$), weight (66.36-67.40 kg, $p=0.016$) and BMI (25.91-26.43 kg/m2, $p=0.0003$) significantly increased. Although mean values of serum creatinine were significantly increased on the 7-year duration (1.022-1.335, $p<0.0001$), the serum creatinine of the patient cohort had been maintained in the normal range.

Conclusion: We show the quality of diabetes care is improved by the cooperative model. The continuous instructions are truly effective for diabetic patients. This study exhibits good improvement in HbA1c as well as fasting blood glucose levels just after the first year. Although the slope becomes flat from the fourth year, sustained improvements of many risk factors in relation to cardiovascular complications occurred. Since the diabetes care are the complicated combination of care resources, our analysis results could suggest more effective instructions, the monitor mechanism for care quality, and the way to establish the standard data system and indications for the institution.

No conflict of interest

P-1350

Modifiable risk factors for cardiovascular disease in the workers at a district hospital in South Africa

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Introduction: Certain risk factors play an important role in a person's chances of developing heart disease. Among these risks some are modifiable. Proactively addressing the modifiable risk factors reduces the chances for a person to develop a cardiovascular disease or die from its complications. Modifiable factors are: smoking or exposure to environmental tobacco smoke, overweight and obesity, sedentary lifestyle, Diabetes Mellitus, high cholesterol/abnormal blood lipids and Hypertension, stress and alcohol. The more risk factors a person has, the greater the likelihood of developing heart disease.

Method: From September 2007 to end of October 2007, workers at Middelburg hospital were invited on voluntary basis to know their "numbers" as far as

the risk for cardiac disease was concerned. The author, echoing the appeal by the South African Medical Association in September 2007 to encourage all South Africans to know their risk for heart disease, advised the Middelburg hospital management that the project be conducted as part of "caring for the carer" programme as it is routinely done by the Occupational Health Unit in the Hospital. Due to cost constraints, cholesterol was not done routinely because the hospital budget could not afford it. A total of 108 hospital workers voluntarily presented themselves at the Occupational Health Clinic for data collection during the two month period.

Results: Of the participants 6% (N=7) had a random glucose of between 7.8 to 11.0 mmol/l and 3% (N=4) had a random glucose of more than 11.1 mmol/l. The abdominal circumference of the majority of the female participants 49% (N=53) was above the normal required for the risk of heart disease and a few male participants had their abdominal circumference above the normal 6% (N=7),. Of the participants 24% (N=26) consumed more than 2 units of alcohol per day. Of the participants 12% (N=14) had grade 1 hypertension, 14 % (N=16) of the participants had stage 2 hypertension and 3% (N=4) of them had severe hypertension. Of the participants 47 % (N=49) had the body mass index above the norms, hence being at risk of heart disease. 88% (N=95) did not engage in any form of physical exercises and 7, 5 % (N=8) were active smokers.

Conclusions: The survey clearly established that the workers employed in a district hospital have the same risk factors for heart disease as anyone in the general population. Some of them who had already a condition that may complicate into a heart disease were not aware of it, because the lack of symptoms or signs related to the said condition, especially hypertension, diabetes, overweight, alcohol consumption and cigarette smoking.

No conflict of interest

CLINICAL RESEARCH

Care of the elderly

P-1351

Type 2 diabetes in the elderly in France: control of vascular risk factors and choice of treatments in 2007 (Entred study)

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Aims: Aging is a major contributor to the increase in diabetes prevalence in France. We used a national diabetes survey to study the control of vascular risk factors in elderly people with type 2 diabetes.

Methods: In 2007, a random sample of 8926 adults was drawn from the French medical insurance system (covering 75% of the population) among people who were reimbursed from at least 3 deliveries of oral hypoglycemic agents or insulin during the past 12 months. All medical reimbursements and hospital data were extracted for 3 years. Three surveys were undertaken: patient short phone interview and mailed-questionnaire (47% and 48% response rates), and a mailed questionnaire to their physicians (62% response rate). A sub-analysis was performed in elderly people (≥65yrs) with type 2 diabetes (n=2466), with weights taking into account the sample design and response rates.

Results: Among all people with type 2 diabetes, 51% of men and 55% of women were aged ≥65yrs. In the elderly, type 2 diabetes was diagnosed since <5yrs in 20%, and in 15% of those ≥80yrs. Based on reimbursement data, 20% were on insulin, 56% on metformin, 53% on sulfonylurea and 27% on other treatments.

Based on patient reports, 42% of the elderly were overweight and 35% obese; obesity decreased with age from 39% in the age-group 65-69yrs to 24% in those ≥80yrs. Based on provider reports, mean HbA1c was 7.1%. The distribution of people with HbA1c >7% with age was "U" shaped: 65-69yrs 50%; 70-74 yrs 44%; 75-79yrs 40%; ≥80yrs 51%. Mean blood pressure (BP) was 135/76 mmHg. Systolic (but not diastolic) BP increased from 134 at ages 65-69yrs to 136mmHg at ages ≥80yrs. Among people with and without antihypertensive treatment, respectively 15% and 11% had BP>150/80mmHg. Mean LDL cholesterol was 1.04g/L. The proportion of people with LDL≥1.30g/L increased from 19% at ages 65-69yrs to 25% at ages ≥80yrs. Among people on hypolipidemic treatment, 66% had LDL<1.30g/L. The proportion of people with glomerular filtration rate (GFR) <60ml/min/1.73m^2 increased from 21% in the ages 65-69yrs to 36% in those ≥80yrs; 46% of people with GFR <60 ml/min/1.73m^2 were on metformin and 50% on sulfonylurea.

At least 1 and 3 severe hypoglycemia during the past year were observed, respectively, in 10% and 4% of the elderly, which was more frequent with age, and with insulin treatment (1 and 3 severe hypoglycemia: 26% and 11%).

Conclusion: While HbA1c and LDL cholesterol are correctly controlled in the majority of elderly people with type 2 diabetes, BP can be better controlled to protect mobility and cognitive functions. Obesity remains a common risk factor even in the oldest. With aging, kidney function is failing and the risk of hypoglycemia is increasing: the use of treatments needs to be more carefully assessed.

Conflict of interest:
Advisory board: Bourdel-Marchasson and Sanofi
Commercially-sponsored research: Bourdel-Marchasson and Servier

P-1352

Development and implementation of diabetes guidelines for elderly residents in long-term care facilities in Nova Scotia

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Background: The Diabetes Care Program of Nova Scotia (DCPNS) works across various sectors of the healthcare system to improve the care provided to people with or at risk of developing DM. The lack of evidenced-based DM guidelines for the elderly population has resulted in both under and over treatment of the frail elderly residing in NS's long-term care (LTC) facilities. Overtreatment may result in increased rates of hypoglycemia—a potentially serious and underestimated clinical problem that has significant morbidity and mortality. Hypoglycemia can lead to poor balance and risk of falls, can be more severe and prolonged, and may precipitate a cardiovascular event. Current clinical practice guidelines set standards of glycemic control that may not be applicable to the residents of LTC facilities.

Aims: To standardize DM management of the frail elderly residing in LTC facilities through the development of reasonable glycemic targets and appropriate treatment of hypoglycemia.

Methods: In 2002, the DCPNS conducted a needs assessment of LTC facilities to explore priorities for standardization of DM care. A multidisciplinary committee was formed to develop and promote safe DM care guidelines. Two priorities were selected: targets for glycemic control and treatment of hypoglycemia. A pocket reference tool was developed and pilot tested in 3 LTC facilities, 1 rural and 2 urban, to determine appropriateness, adequacy, efficiency, and effectiveness of the tool. Eleven nurses in 3 facilities used the reference tool for 4 weeks and provided feedback for necessary revisions. The guidelines received preliminary approval of the DCPNS Advisory Council in 2007, and final amendments were approved in Feb. 2009. A province-wide telehealth session was held Dec. 2008 to provide context for LTC staff, physicians, and DM educators.

Results: The needs assessment was completed by directors/managers and care providers within provincial LTC facilities. A 78% response rate was achieved with 80% of respondents reporting the need for standard DM management protocols. The target population for the guidelines was non-palliative residents for whom DM care interventions are appropriate. Key characteristics of DM care guidelines include flexibility, individualization, and improved quality of life.

Discussion: The pocket reference guide is a highly anticipated resource that will standardize DM care in LTC facilities in NS. Reduction in over-treatment of DM by adherence to the recommended hyperglycemic targets should result in fewer episodes of hypoglycemia, less stringent treatment plans, and improved quality of life for some residents. Adverse events, secondary to hypoglycemia, will be reduced.

No conflict of interest

P-1353

Comparison of the efficacy and tolerability of the once-daily human GLP-1 analogue, liraglutide, in elderly versus younger patients with type 2 diabetes: a meta-analysis

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Aims: The number of elderly people diagnosed with type 2 diabetes (T2D) is rising. There is limited evidence for efficacy and tolerability of T2D treatments available for this special population. This meta-analysis of the six phase 3 trials for liraglutide (Liraglutide Effect and Action in Diabetes [LEAD]) investigated changes in HbA_{1c}, body weight (BW), systolic blood pressure (SBP) and hypoglycaemia from baseline to 26 weeks in elderly (>65 years) vs young (≤65 years) patients with T2D receiving liraglutide 1.8 mg/day or placebo.
Materials and methods: HbA_{1c}, BW and SBP data from the 6 trials were stratified by age, >65 years (n=474) and ≤65 years (n=2276). The changes in HbA_{1c} and body weight were analysed by age group using ANCOVA.
Results: Reduction in HbA_{1c} from baseline was significantly greater after 26 weeks with liraglutide 1.8 mg vs placebo for both age groups ($p<0.0001$). Reductions in HbA_{1c} with liraglutide 1.8 mg were similar between ≤65-years vs >65-year age groups: -1.39 vs -1.32%, respectively. These reductions in HbA_{1c} with liraglutide brought a high number of subjects below the American Diabetes Association HbA_{1c} target of 7%: 68% in the age group ≤65 years and 60% in the age group >65 years. BW reduced significantly from baseline with liraglutide 1.8 mg in ≤65-year and >65-year age groups (-1.71 and -2.17kg, respectively; both $p<0.0001$ vs baseline) whereas reductions seen with placebo, for both age groups, were not significant (-0.51 and -0.70 kg, respectively; p=NS vs baseline). No significant difference in BW change, between age groups, with liraglutide and placebo were observed. Reduction in SBP from baseline, with liraglutide 1.8 mg, was significant in age group ≤65y (-2.96; $p<0.001$). Improvements in SBP with liraglutide 1.8 mg were more pronounced in the ≤65-year age group vs >65-year age group (-0.86 mmHg: difference of -2.09 mmHg, $p<0.05$) but not with placebo (+0.39 mmHg: difference of -0.71, p=NS). The proportion of subjects reporting minor hypoglycaemia was low and similar between age groups with liraglutide 1.8 mg (13.4% [≤65 years] and 13.9% [>65 years]) and placebo (8.3% [≤65 years] and 8.0% [>65 years]). Adverse events were predominantly gastrointestinal in nature, that is, nausea. The proportion of subjects experiencing nausea with liraglutide 1.8 mg was 11.3% (≤65 years) vs 14.7% (>65 years), respectively.
Conclusions: These data show that the efficacy of liraglutide with respect to HbA_{1c} and weight is independent of age in T2D, and that liraglutide is well-tolerated in patients ≤65 years or >65 years with low risk of hypoglycaemia.

Conflict of interest:
Paid lecturing: B Bode, R Pratley: Novo Nordisk
Employee: A Falahati, J Brett: Novo Nordisk
Commercially-sponsored research: B Bode, R Pratley: Novo Nordisk
Other substantive relationships: B Bode: Novo Nordisk (consultant)

P-1354

Why are older patients with type 2 diabetes treated for dyslipidemia but not for hyperglycemia?

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Aims: Previous research has highlighted the need for earlier intervention in diabetes. This study examined older patients treated for dyslipidemia but not type 2 diabetes (T2DM) for >6 months after T2DM diagnosis, and assessed reasons for non-treatment with antihyperglycemic agents (AHA).
Methods: A survey was conducted in Nov/Dec-2008 among a panel of U.S. primary care physicians. Patients aged >=65 years at time of T2DM diagnosis, who had not initiated AHA therapy for >=6 months after diagnosis, were selected by their physicians. Each physician provided data for 2 patients based on chart review and reasons for not initiating AHA therapy. In this analysis we focused on a subgroup of patients who currently received lipid lowering therapy.
Results: 441 patients (57.3% of 770 older patients with untreated T2DM) were receiving treatment for dyslipidemia; mean (SD) age was 71.4 (5.7) years, 52.6% were male, mean BMI was 30.3 (4.9), and average duration of diabetes was 21.1 (24.0) months. Most recent mean measures were 6.8% (0.6) for HbA_{1c} (with 32.6% not at goal <7%), and 7.1 mmol/L (1.5) for FPG (44.6% were >=7.0 mmol/L). Macrovascular complications were reported in 24.9% of patients, and microvascular in 17.2%. 46.3% of patients had an estimated glomerular filtration rate <60 mL/min/1.73m^2. 79.1% were being treated with an antihypertensive. Median number of current medications used was 4. The distribution of the first ranked physician reasons for not initiating AHA therapy was "try diet and exercise first (D&E)" 53.9%, "mild hyperglycemia" 25.6%, "patient's concerns" 14.8%, "concerns related to AHAs" 3.2%, and "issues with comorbidity and polypharmacy" 2.5%. However, the corresponding proportions of patients with HbA_{1c} >=7% were 27.5%, 25.0%, 59.4%, 50.0%, and 45.5% respectively. Based on most recent measure, HbA_{1c} had increased since diagnosis in 16.4% of all patients and 26.0% of patients with recent HbA_{1c} >=7%. Among 112 patients who were scheduled to be treated with AHA within a month as indicated by their physician, 57% had a current HbA_{1c} above the threshold specified by their physician for medication initiation.
Conclusion: In these older patients treated for dyslipidemia, but not treated with AHA for >6 months since T2DM diagnosis, one third had HbA_{1c} levels above goal and some already had macro-/micro-vascular complications. Reasons for non-treatment with AHA suggest there are substantial barriers to AHA use in real world practice, including physician's perception of "mild hyperglycemia" and the HbA_{1c} threshold for initiating AHA, which should be explored further.

Conflict of interest:
Stock ownership: Q. Zhang and L. Radican are owners of Merck stock
Employee: Q. Zhang and L. Radican are employees of Merck & Co.
Commercially-sponsored research: M. Feinglos receives research grant support from Merck & Co.
Other substantive relationships: E. Marrett is a Merck funded research fellow.S. Narayanan has had a financial relationship with Merck & Co. (research support)

P-1355

Abnormal carbohydrate metabolism and diabetes mellitus among elderly people of Kyrgyz Republic

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The demographic situation in Kyrgyzstan is characterized by the increased number of elderly people. Considering the fact that the prevalence and features of carbohydrate metabolism abnormalities among the elderly and senile people are not thoroughly investigated, we have examined 217 people in the age group from 60 to 91 using the random sampling research method. People, who had diabetes mellitus diagnosis before, or any other intolerance to glucose, were excluded from the sampling. Anthropometric measurements have been made for every patient (height, weight, waist). Also data concerning the arterial pressure of patients have been collected. Glucose measurements have been made in the whole blood. Diabetes mellitus has been diagnosed in the case of whole blood glycemia (fasting) with ≥6,1 mmole per liter or in case of the capillary whole blood glycemia ≥11 mmole per liter (any time of a day). Also, type 2 diabetes mellitus risk factors have been assessed with the help of the ADA (American Diabetes Association) tests. All patients had the risk of type 2 diabetes occurrence: 14 % - moderate risk, 86% - high risk. The highest probability for type 2 diabetes occurrence has been noticed among the senile group (90.3 %). 78% of the sample had the lipid exchange abnormalities, and out of them 48% had overweight, 30% - obesity. Blood pressure increase has been recorded in 76.1% of the sample. Hypertension has been recorded more often among the senile people than among elderly. Carbohydrate metabolism abnormalities have been recorded in 99 cases (50.5 %), out of them explicit diabetes mellitus diagnosed in 56 cases (28.6%). Diabetes mellitus course has been asymptomatic among the patients; without complains concerning urinary emaciation, pruritus, or the weight loss. In the majority of cases patients' complains concerned the nonspecific issues, such as asthenia, vertigo, memory impairment, and other cognitive dysfunctions. Because of these symptoms the diagnosis of diabetes mellitus has been complicated. Upon the moment of the diagnosis registration, 50% of patients already had micro- and macro vascular complications.

So, taking into consideration the fact that the proportion of the elderly people is growing, some specific activities should be organized within the healthcare system of Kyrgyzstan, dealing with the active detection and treatment of diabetes mellitus, especially among senile and aged people. Heroprotection should be not just about the life prolongation; instead it should deal with prolongation of healthy, high quality life.

No conflict of interest

P-1356

A clinical feature analysis of type 2 diabetic inpatients from middle-aged to aged with poorly-controlled plasma glucose problem

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Aim: To investigate the clinical features and chronic diabetic complications from middle-aged and aged diabetic inpatients with poorly-controlled glucose problem.
Methods: A total of 449 subjects over 40 years old with type 2 diabetes were enrolled in the study, and the entry level of HbA1c was >= 7.5%. All subjects were divided into two groups according to the medical history: known diabetes (KDM) and diabetes newly diagnosed by the study (NDM), and were further divided into middle-aged subgroup and aged subgroup respectively. Clinical features and chronic diabetic complications were evaluated for all subjects.
Results: 1.In both middle-aged and aged subjects, compared with those who had a definite type 2 diabetes history, newly-diagnosed patients showed a significantly higher level of HbA1c and GA. 2.The incidence rate of diabetic nephropathy, diabetic retinopathy, diabetic peripheral neuropathy and peripheral vascular disease were 19.4%, 32.7%, 17.4% and 52.1% respectively in all study subjects. 3. In 45% of newly-diagnosed diabetic patients, at least one chronic diabetic complication was confirmed at the time they were diagnosed. More than 33% in aged subgroup with definite history of type 2 diabetes suffered from more than 2 kinds of chronic diabetic complications.
Conclusion: Screening should be made as soon as possible to prevent chronic diabetic complication for newly-diagnosed diabetic patients. The aged group has a higher incidence rate of more than 1 kind of chronic diabetic complication. Therefore, risk factors should be intervened comprehensively together with the effective control of glucose level in order to delay the occurrence and development of chronic diabetic complications.

No conflict of interest

Complications - kidney

P-1357

Prevalence and determinants of anemia in type 2 diabetes mellitus in India

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Background and Objective: Presence of anemia in type 2 diabetes is associated with accelerated micro- and macro-vascular complications. To determine prevalence and determinants of anemia in Asian Indian type 2 diabetes mellitus subjects we performed a clinical audit.
Methods: Data of successive patients of type 2 diabetes (n= 1696, men 1059, women 637) presenting to this centre were analysed for demographic and lifestyle factors, prevalence of cardiovascular risk factors, anemia and other complications. Descriptive statistics are reported.
Results: The mean age of the subjects was 53.2±10 years and duration of known diabetes 7.5±6.9 years. Prevalence (%) of smoking or tobacco use was in 346 (20.4), hypertension in 785 (46.3), ischemic heart disease in 152 (9.0), cerebrovascular disease in 25 (1.5), renal disease- creatinine >1.8 mg/dl in 41 (2.4), asthma in 41 (2.4), and hypothyroidism in 62 (3.7). Mild anemia (haemoglobin (Hb) men 11.0-12.9, women 10.0-11.9 g/dl) was in 898 (41.3), men 414 (39.0), women 287 (44.9); moderate anemia (Hb men 8.0-10.9, women 8.0-9.9) was in 84 (4.9), men 28 (2.6), women 56 (8.0) and severe (Hb <8.0) in 13 (0.8). Hb levels correlated (Spearman's rho) significantly with age (-0.23), diabetes duration (-0.23), smoking (0.13), tobacco chewing (0.13), dietary calories (0.19), proteins (0.17), fiber (0.24) and iron (0.25), creatinine clearance (0.33), systolic blood pressure (-0.11), and presence of hypertension (0.12), nephropathy (0.15), ischaemic heart disease (0.11) and hypothyroidism (0.10) ($p<0.05$ for all). Important univariate risk factors for anemia were age (odds ratio 1.04, 95% confidence intervals 1.03-1.05), diabetes duration (1.49, 1.33-1.67), hypertension (1.24, 1.03-1.50), presence of nephropathy (5.50, 2.42-12.50) and low dietary iron (0.91, 0.87-0.97). Significant multivariate determinants of anemia were dietary iron (0.95, 0.91-0.99), diabetes duration (1.04, 1.03-1.06) and presence of nephropathy (4.82, 2.11-11.1).
Conclusions: Mild to moderate anemia is common in Asian Indian subjects with diabetes. Important determinants of anemia are advancing age, increasing duration of diabetes and presence of renal disease. Low dietary iron is an important lifestyle determinant.

No conflict of interest

P-1358

Correlation of incipient nephropathy and baPWV in type 2 diabetes - a comparative study

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Background and aims: Microalbuminuria has been identified as a risk factor for cardiovascular disease in diabetic populations. The nature of this relationship is unclear but may involve arterial stiffness, an independent risk marker for CVD mortality. Pulse wave velocity (PWV) is regarded as a marker to reflect arterial stiffness associated with atherosclerosis and also impaired endothelial functions in diabetic patients. Aim of the study is to examine whether microalbuminuria in type 2 diabetes patients is associated with altered baPWV - an early marker of atherosclerosis.
Methods and materials: 800 type 2 diabetes patients were enrolled in the study. Microalbuminuria in all the subjects was estimated and the albumin to creatinine ratio (A:C) determined. Patients were divided into 2 groups. Group A contained 400 type 2 diabetes patients (230 males/170 females) with incipient nephropathy [A:C 30-300 mg/gm]. The mean age was 50.3±10.73 years with mean duration of diabetes 6.71±3.9 years. Group B contained 400 type 2 diabetes patients (183males/217 females) with Normoalbuminuria [A:C<30mg/gm]. The mean age was 53.18±10.42 years with mean duration of diabetes 7.1±6.3 years. baPWV, Blood Pressure, A1c, BMI, ABI of all the subjects in group A and group B were also measured. baPWV was measured with VP-2000/1000-Colin Corporation, (hyayashi komaki Japan). Microalbuminuria was measured Clinitek status Analyzer. (Bayer Health Care)
Results: Correlation of Albumin to Creatinine Ratio with other Atherosclerotic parameters

	Group a Incipient nephropathy		Group b Normoalbuminuria	
	Mean±S.D.	p	Mean±S.D.	p
baPWV (RT)	1905.14±513.13	<.001	1906.39±513.89	NS
baPWV (LT)	1650.07±449.51	<.001	1647.49±449.70	NS
HbA1c	7.2±1.50	<.01	7.28±1.50	<.05
BMI	27.33±6.103	NS	27.33±6.09	NS
S.B.P	151.7±20.44	NS	151.68±20.44	NS
D.B.P	88.1±11.6	NS	88.15±11.60	NS
ABI (RT)	1.09±0.27	NS	10.8±0.27	NS
ABI (LT)	1.05±0.24	<.05	1.05±0.24	<..05

Discussion: Present study showed highly significant correlation of incipient nephropathy with baPWV compared to normoalbuminuric diabetes patients. A similar correlation was also seen with HbA1c and ABI.This implies a higher association of microvascular complications in this group of patients thus necessitating increased detection and control of such complications. The above correlation confirms a strong link between renal and CV disease in the early asymptomatic stage of disease.

No conflict of interest

P-1359

The oxidative stress and antioxidant potency determined by Free Radical Analytical System 4 (FRAS 4) are firmly involved in the progression of diabetic retinopathy and nephropathy in patients with type 2 diabetes mellitus

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The pathogenesis of diabetes provokes an oxidative stress through an activation of the NADPH oxidase or the polyol pathway induced by hyperglycemia. An excess of oxidative stress leads to the advance and/or the progression of chronic diabetic vascular complications. The main purpose of the present study is to elucidate the relationship between the oxidative stress determined by Free Radical Analytical System 4 (FRAS 4) and clinical diabetic features and vascular complications in type 2 diabetic patients. Studies were conducted in 51 type 2 diabetic patients and age-matched 20 healthy subjects. We investigated various diabetic features, and then evaluated daily urine albumin excretion (UAE), Achilles tendon reflex, the grade of retinopathy, ABI and PWV, as diabetic complications. The level of serum oxidative stress was measured by Reactive Oxidative Metabolites (ROM) test, while serum antioxidant potency was determined by Biological Antioxidant Potential (BAP) test using RFAS-4 method (Wismerll Inc. Tokyo, Japan). Serum superoxide dismutase (SOD) activity was assayed by the electron spin resonance method. ROM in diabetic patients markedly tended to increase rather than that in healthy subjects. (diabetic patients: 260.3±54.8 U.CARR, healthy subjects: 237.1±39.4 U.CARR). ROM showed a significantly positive correlation with HbA1c levels in diabetic patients (r=0.281, P=0.045). ROM tended to increase according to the progression of diabetic retinopathy. While BAP significantly reduced according to the deterioration of smoking state. BAP also tended to decrease according to the progression of diabetic retinopathy and showed a significantly negative correlation with UAE (r=-0.333, p=0.029). SOD activity remarkably reduced according to the deterioration of smoking state, and significantly reduced according to the progression of diabetic retinopathy (r=-0.337, p=0.017).
Conclusions: The present study suggest that increase in ROM, a surrogate marker for oxidative stress, and decreases in BAP and SOD activity, representative markers for antioxidant potency, could be firmly involved in the deterioration of blood glucose control and smoking state, and also in progressions of diabetic retinopathy and nephropathy in diabetic patients.

No conflict of interest

P-1360

Histopathology on renal biopsy in diabetes with overt proteinuria or microalbuminuria: effect of nondiabetic lesions on GFR and proteinuria.

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Aims: To study the histopathology on renal biopsy in diabetes with proteinuria to compare the amount of proteinuria and creatinine clearance in cases with diabetic or nondiabetic lesions.
Methods: 50 cases of diabetes mellitus with proteinuria were studied. These included 15 cases of type 1 and 35 cases of type 2 diabetes. They were divided into two groups:-
GROUP1-type 1 diabetes mellitus
a) with microalbuminuria (4 cases)
b) with overt proteinuria (11 cases)
GROUP2-type 2 diabetes mellitus
a) with microalbuminuria (11 cases)
b) with overt proteinuria (24 cases)
Their creatinine clearances were calculated using Cockroft Gault equation. They were subjected to renal biopsy with Bard Max Core Disposable Biopsy Instrument under ultrasound guidance and histopathologically evaluated for both diabetic and nondiabetic renal lesions.
Results: Frequencies of various renal parenchymal histopathological lesions demonstrated in our study were :-
a. 70% had diabetic lesions (diffuse diabetic glomerulosclerosis-58% and nodular diabetic glomerulosclerosis.)
b. 18% had non diabetic lesions (renal amylidosis-4%, mesangiocapillary glomerulonephritis-2%, membranous glomerulonephritis-6%, acute glomerulonephritis-2%, chronic pyelonephritis-4%) and
c. 12% had non diabetic lesion superimposed on diabetic lesions (diffuse diabetic glomerulosclerosis+interstitial nephritis-2%, diffuse diabetic glomerulosclerosis+membranous glomerulonephritis-6%, nodular diabetic glomerulosclerosis+interstitial nephritis-4%).

The 24 hour Urinary protein in cases with diabetic lesions was 694.6+-830.4,and in nondiabetic lesions 1928.9+- 1285.4 mg,while in nondiabetic lesions superimposed on diabetic lesions it was 2716.7+-1463.44 mg.The levels in the latter 2 groups were significantly greater ($p<0.01$) than in cases with diabetic lesions alone.
Mean Creatinine clearance in cases with pure diabetic lesions was 70.7+-32.88 ml/min, while this was 37.7+-29.16 ml/min with nondiabetic lesions and in cases of nondiabetic lesions superimposed on diabetic lesions it was 17.5+-5.45 ml/min. The levels in the latter 2 groups were significantly lower as compared to cases with diabetic lesions alone ($p<0.01$).
The differences between the nondiabetic lesion group and the mixed diabetic and nondiabetic lesion were not significant for both these parameters.
Conclusions: It is felt that renal biopsy should be done in cases of diabetes mellitus with proteinuria because the presence of non diabetic renal lesions is not uncommon and these adversely affect renal function and modify clinical management.

No conflict of interest

P-1361

Insulin resistance in non-diabetic chronic kidney disease patients with chronic renal failure – a new aspect of one old problem

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Background: A state of insulin resistance is present from the early stages of chronic renal failure and has potential implications with respect to the high cardiovascular morbidity and mortality in patients with renal disease.
Aim: To investigate some aspects of impaired carbohydrate metabolism in predialysis patients with chronic renal failure.
Methods: 75 non-diabetic patients with chronic renal failure were investigated. Glycated hemoglobin and levels of immunoreactive insulin were measured in all predialysis patients. Oral glucose tolerance test was performed according to standard protocol. The control group included 30 healthy subjects.
Results: The baseline levels of plasma immunoreactive insulin showed a tendency towards increasing in patients with chronic renal failure as compared with the controls (7.2 ±1.1 IU/ml vs 6.4±0.7 IU/ml). No significant differences were found at the 1st, 2nd or 3rd hour following the ingestion of glucose as compared with the healthy subjects. Five patients had significantly elevated basal insulin levels. Mean level of glycated hemoglobin was 5.9±0.5% in patients with first degree chronic renal failure. There was a trend towards higher levels of glycated hemoglobin in patients with second and third degree chronic renal failure (6.3±0.6% vs 5.5±0.4% in controls). The results of oral glucose challenge test revealed impaired glucose tolerance in 39 predialysis patients - mean 2nd-hour blood glucose level 9.1±1.6 mmol/l. No significant disturbances in carbohydrate metabolism were found in patients with mild chronic renal failure. We found significant correlation between impaired carbohydrate metabolism with severity of arterial hypertension and duration of chronic renal failure.
Conclusions: Changes in carbohydrate metabolism and basal immunoreactive insulin levels which we found suggest insulin resistance includes moderate and advanced insulin resistance. Early detection of these disturbances would contribute to effective prevention of formation and progression of vascular lesions in non-diabetic patients with chronic renal failure.

No conflict of interest

P-1362

The effect of statins on apoptosis in kidneys of diabetic rats

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Aims: Treatment with hydroxymethylglutaryl coenzyme A reductase inhibitors (statins) may retard the development of diabetic nephropathy. This study was to investigate the effect of statins on apoptosis in diabetic kidneys in rats.
Materials and methods: Eighty Sprague-Dawley rats were divided into four groups randomly: the first group consisted of healthy controls; the second group included the untreated STZ-diabetics; three or six months of simvastatin or xuezhikang (red rice extract,which contains a mixture of statins) treated STZ-diabetics formed the third and the fourth groups, respectively. Terminal deoxynucleotidyl Transferase Biotin-dUTP Nick End Labeling (TUNEL) method was used for detection of apoptosis. Immunohistochemical staining and western blotting for Bax and Bcl-2 expression were also performed.
Results: TUNEL staining showed that apoptotic cells especially increased in the kidney tubuli of untreated diabetic group and a decrease was observed in both groups that received statin treatment. An increase in Bax expression in immunohistochemical staining was observed in the podocytes, mesangial cells, and the tubule cells of the untreated diabetic group after three or six months; both three and six months of simvastatin treatment could significantly decreased the expression of Bax ($p<0.01$); six months of xuezhikang treatment could significantly decrease the expression of Bax ($p<0.01$), but no significant difference was observed after three months of xuezhikang treatment. Up-regulation of Bcl-2 expression was observed in the above cells after three months in diabetic group compared to control group ($p=0.01$), but no difference was found between the two groups after three months; simvastatin up-regulated the expression of Bcl-2 compared with diabetic group time dependently ($p<0.05$ and $p<0.01$, respectively); xuezhikang up-regulated the expression of Bcl-2 only after six months of treatment ($p<0.05$) compared with diabetic group. In addition, three and six months of statin treatment decreased Bax/Bcl-2 ratio ($p<0.05$ and $p<0.01$), which was up-regulated in diabetic group. Western Blotting showed an increase in the expression of Bax in diabetic group after three and six months; both simvastatin and xuezhikang treatment could inhibit the expression of Bax compared to diabetic group. Expression of Bcl-2 detected by western blotting increased to some extent after three months in diabetic group compared to control group, which disappeared after six months; both simvastatin and xuezhikang treatment increased the expression of Bcl-2 compared to diabetic group.
Conclusion: Our results indicate that statins could reduce apoptosis present in diabetic nephropathy and the beneficial effect might partly be attributed to the regulation of Bax/Bcl-2 ratio.

No conflict of interest

P-1363

Oxidative stress marker and microinflammation in diabetic nephropathy with type2 diabetes

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Background: Oxidative stress and microinflammation play important role in diabetic vasculopathy. The production of reactive oxygen species and microinflammation are increased in both animal models of diabetes and diabetic human subjects.
Objective: The aim of this study was to clarify the predictors of urinary albumin excretion (UAE) from oxidative stress and microinflammation in type 2 diabetic subjects.
Materials and methods: Thirty five outpatients (male 21, female 14) with type 2 diabetes who met the following criteria were enrolled: (1)systolic arterial Blood Pressure (SBP) <160 mmHg, (2) diastolic arterial Blood Pressure (DBP) <110 mmHg, (3) absence of marked hyperglycemia (HbA1c <8.0%). Exclusion criteria were acute and chronic inflammatory disease, current smokers, liver disease, and renal dysfunction (serum creatinine >1.1mg/dl).Plasma levels of high sensitivity C-reactive protein (hs-CRP), creatinine, HbA1c,Plasma glucose (PG), Total cholesterol (TC), Triglyceride (TG) and High density cholesterol (HDL-C), urinary albumin excretion (UAE), 8-hydroxydeoxyguanosine (8-OHdG), and 8-epiprostangine (PGF2-α),and BP were measured. The univariate analysis was performed. The multivariate analysis was performed to urinary albumin excretion. Data were expressed as Mean ± SD. P value of <0.05 were considered as a level of significance.
Results: Of 35, 18 diabetic subjects had hypertension. Of 18, 14 subjects were taking ARBs, 7 were taking Ca channel blockers, 1 was taking ACEI, 1 was taking ß blocker. In diabetic subjects, age, BMI, BP, and duration, were 62±11 years, 26.1±5.7 kg/m2, 129 ±12/77±13mmHg, and 6±6years. Cr, TC,TG,HDL-C,PG, HbA1c,hs-CRP, urinary 8-OHdG, urinary PGF2-α, and UAE were 0.78±0.15mg/dl, 195±33mg/dl, 146±127mg/dl, 51±14 mg/dl, 141±33mg/dl, 6.3±0.6%, 0.141±0.169 mg/dl, 9.0±3.0ng/mg.Cr, 140.6±32.9pg/mg. Cr, and 57.7± 88.3mg/g.Cr. There was a relationship between PGF2-α ($R=0.518$, $R2=0.268$, $p<0.005$) or hs-CRP ($R=0.486$, $R2=0.236$, $p<0.005$)and UAE. On multivariate analysis, Cr, PGF2-α and hs-CRP predicted UAE (multiple, $R=0.674$ $R2=0.455$, $p<0.001$). On the other hand, BP, TC,TG,HDL-C,PG, HbA1c didn't predict UAE. Similarly, 8-OHdG didn't predict UAE.
Discussion: Under relatively controlled hyperglycemia and blood pressure (HbA1c 6.3±0.6%, BP 128 ±11/75±11mmHg) the microinflammation and the oxidative stress may be implicated in the progression to diabetic nephropathy. It seemed that BP didn't predict UAE due to relatively control.
Conclusion: These results suggest that the microinflammation and the oxidative stress are implicated to urinary albumin in type 2 diabetic patients.

No conflict of interest

P-1364

Mesoglycan prevents morphological renal alterations in diabetic rats

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Aims: Diabetic nephropathy forms a serious complication in patients with diabetes mellitus. Morphologically, diabetic nephropathy is characterized by thickening of the glomerular basement membrane (GBM). Major components of basement membrane are heparan sulfate (HS) proteoglycans. A defect in the regulation of HS production by endothelial, myomedial and mesangial cells determines the susceptibility of diabetic patients to developing proteinuria. Numerous reports showed that HS prevents diabetic nephropathy. The aim of this study is histologic analysis of pathologic renal changes in normal and untreated or Mesocan (major component of Mesocan is HS)-treated diabetic rats with albuminuria.
Methods: We analysed pathologic finding of control rats (n=5), untreated-diabetic rats (n=5) and mesocan-treated diabetic rats (n=5) with albuminuria. Daily dosage of mesocan in treated rats was 200mg/kg and period of administration was 5 weeks. Periodic acid Schiff (PAS) and collagen III staining were performed to histologic analysis.
Results: Diabetic rats exhibited an accumulation of PAS-stained mesangial matrix, which was not observed in the control or mesocan-treated animal. The immunohistochemical analysis of collagen III revealed positive staining in the glomerular mesangial matrix of untreated diabetic rats; staining was significantly less extensive in normal glomeruli and in mesocan-treated diabetic rats.
Conclusion: Our data demonstrate that administration of mesocan has a favorable effect on morphological renal abnormalities in diabetic rats.

No conflict of interest

P-1365

Increased vascular calcification compared to bone mineral density in diabetic patients on regular dialysis treatment

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Cardiovascular disease in dialysis patients is associated with increased vascular calcification (VC) and arterial stiffness, both inversely correlated with bone mineral density (BMD). Few studies have correlated VC in diabetic patients

on regular hemodialysis treatment with measurements of BMD and arterial compliance. Data of 90 haemodialysis (HD) patients assessing the prevalence of VC and its associations. Patients had computed tomography scans through abdominal aorta and superficial femoral arteries (SFA) to determine VC, and dual-energy X-ray absorptiometry (DXA) to determine BMD. Patients were divided into diabetic and non-diabetic groups. Patients, 55% male, 40% diabetic, had median age 48 years. Mean aortic VC score 488.1 ± 298 Hounsfield units, with 91% having aortic VC present. In univariate linear regression analysis, aortic VC correlated positively with length of HD (P = 0.01) and diabetes (P = 0.03) and hyperphosphatemia (p = 0.05) and negatively with secondary hyperparathyroidism. In multivariate regression analysis, length of HD and diabetes were significantly associated with aortic VC, whereas age and diabetes were associated with SFA VC. Mean lumbar spine and femoral neck T-scores on DXA were 0.14 and -1.66 respectively but there was no significant difference between diabetic and non-diabetic groups. Univariate linear regression analysis showed inverse correlation between aortic VC and femoral neck T-scores in non-diabetic but not in diabetic hemodialysis patients. Conclusion: Increased VC is common in HD patients. Bone vascular axis is activated in diabetic dialysis and with increasing age resulting in more VC, and greater aortic VC is seen with longer duration of dialysis and lower bone dynamics in diabetes mellitus.

No conflict of interest

P-1366

Risk factors of normal ankle-brachial index and low toe-brachial index in diabetic patients on regular hemodialysis treatment

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The prevalence of peripheral arterial occlusive disease is high in patients with diabetes mellitus, exacerbated in chronic renal failure and thus it is a major problem in those on hemodialysis. A low ankle-brachial index (ABI) suggests the presence of arterial stenotic lesions between the aorta and the ankle joint, while a low toe-brachial index (TBI) suggests stenotic lesions between the aorta and the toes. Therefore, a normal ABI (≥0.9) and a low TBI (<0.6) may indicate the presence of stenotic lesions located only on the peripheral side of the ankle joint. In the present study, risk factors of normal ABI/low TBI were investigated. In 175 patients on maintenance dialysis, the ABI and TBI were simultaneously measured.The background factors and laboratory data of patients with normal ABI/low TBI (L group) and those with normal ABI/normal TBI (≥0.6) (N group) were compared. Patients on regular hemodialysis treatment were divided into two groups; diabetic (D group) and non-diabetic (ND group). Low ankle-brachial and toe-brachial indices were detected in 39% and 22% of the patients, respectively. Comparison of the background factors and laboratory data between groups showed that the ratio of diabetes mellitus, interdialytic body weight gain, and hyperphosphatemia values were significantly higher in the L group than in the N group. It was concluded that uncontrolled diabetes, excess body weight gain and increased blood phosphorus are involved as risk factors in dialysis patients with normal ABI/low TBI.

No conflict of interest

P-1367

Plasma adiponectin/hs-CRP ratio in type 2 diabetic patients with diabetic nephropathy

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Background and aims: Adiponectin is the only adipocytokine known to produce insulin-sensitizing effects and to have anti-atherosclerotic, anti-inflammatory properties. Low plasma levels of adiponectin were associated with insulin resistance, type 2 DM and atherosclerotic cardiovascular diseases. The aim of this study was to investigate the relationship between plasma levels of adiponectin, markers of inflammation and diabetic nephropathy (DN) in patients with type 2 DM.
Material and methods: The study enrolled 115 patients with type 2 DM, 58 men (51.8%) and 54 women (48.2%), with the mean age 59.6 ± 7.2 years. Laboratory analyzes performed in study subjects included serum creatinine, urine albumin/ creatinine ratio, plasma levels of adiponectin, high-sensitive C reactive protein (hs-CRP), interleukin 6 (IL-6), tumor necrosis factor a (TNF-a). Subjects were divided by the presence and severity of DN into 4 categories: I, normoalbuminuria (urine albumin < 30µg/mg creatinin); II, incipient DN (urine albumin 30 – 299 µg/mg creatinin); III, overt DN (urine albumin = 300 µg/mg creatinin); IV, chronic renal failure with serum creatinine = 2mg/dL. Glomerular filtration rate (GFR) was estimated by the Modification of Diet in Renal Disease Study (MDRD) equation: 175 x (serum creatinine mg/dL)$^{-1.154}$ x age$^{-0.0203}$ x (0.742 if female).
Results: Plasma levels of adiponectin were increased in the advanced stages of DN. Also, plasma TNF-a, IL-6 and hs-CRP increased with the severity of DN. Adiponectin/ hs-CRP ratio decreased significantly (p<0.001) with the severity of DN (Table 1).

Table 1: Adiponectin, adiponectin/hs-CRP ratio and inflammatory markers in subjects with diabetic nephropathy

	I. normo-albuminuria	II. Incipient DN	III. Overt DN	IV. Chronic Renal Failure	P (ANOVA)
N	65	27	14	9	-
Adiponectin (µg/mL)	6.5 ± 0.8	7.3 ± 1.2	8.2 ±1.6	9.8 ± 2.1	<0.001
hs-CRP (mg/L)	3.1 ± 0.5	4.4 ± 0.9	5.1 ± 1.3	6.4 ± 1.7	<0.001
Adiponectin/hs-CRP ratio	2.10 ± 0.41	1.66 ± 0.32	1.61 ± 0.29	1.53 ± 0.25	<0.001
TNF-a (pg/mL)	7.8 ± 0.9	8.4 ± 1.4	9.1 ± 1.6	10.3 ± 1.9	<0.001
IL-6 (pg/mL)	3.7 ± 0.6	4.3 ± 0.8	4.9 ± 1.3	5.7 ± 1.5	<0.001
Data are n (%) or mean ± SD.					

Plasma adiponectin /hs-CRP ratio was negatively correlated with urine albumin excretion (r= - 0. 63) and with GFR (r= -0.56) independently. Plasma adiponectin was positively correlated with serum creatinine (r= 0.54) in type 2 diabetic patients with DN.
Conclusions: Plasma levels of adiponectin were positively correlated with the severity of DN. Adiponectin may be enhanced in type 2 DM patients with DN as a physiological counterregulatory response trying to mitigate the endothelial damage. Although adiponectinemia is increased in advanced stages of DN, the adiponectin/hs-CRP ratio is decreasing with the severity of DN, indicating that advanced stages of DN are proinflammatory states.

No conflict of interest

P-1368

How important is the presence of microalbuminuria at diagnosis of type 2 diabetes mellitus?

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Background: Microalbuminuria (albumin excretion rate between 30-300 mg/24h) is an early warning sign of impending clinical nephropathy and cardiovascular disease in patients with diabetes mellitus. A transitory albumin excretion and hyperglycemia can occur together at the time of diagnosis of type 2 Diabetes Mellitus (T2DM). However, microalbuminuria persistent after adequate glycemic control may also represent incipient nephropathy with a risk of progression to overt proteinuria of 60-80% over 6-14 years.
OBJECTIVE: The aim of this study was to determine the presence of microalbuminuria at diagnosis of type 2 diabetic patients.
Patients and methods: A Cross-Sectional Study of clinical and laboratoy data of type 2 diabetic patients consecutive newly diagnosed on occasion of the campaign developed by the National Diabetes Association (ANAD) for World Diabetes Day in 2007, Sao Paulo, Brazil. Microalbuminuria was estimated by measuring urine albumin/creatinine ratio in an early morning urine sample during the first visit. Blood pressure, body mass index (BMI) and glycated haemoglobin (HbA1c) were also determined. All analyses were performed with the use of Stata software, version 7.0.
Results: A total of 153 patients were studied (57 % female) with a mean age of 51.7±6.3 years. The prevalence of essential hypertension was 23.8%. The BMI were 28.1±2.7 Kg/m^2. The prevalence of microalbuminuria and macroalbuminuria was 17.0% and 3.92%, respectively. Statistically microalbuminuria did not differ significantly in age, gender, BMI or initial blood pressure.
Conclusions: In our study, the prevalence of microalbuminuria at diagnosis of T2DM was 17.0%. The majority of the studies have shown persistent microalbuminuria in 19 to 20 % of the newly diagnosed T2DM. Although

our data are isolated and the diagnosis must be confirmed with 24-h UAE, this finding indicates that albuminuria is still the best test to predict diabetic nephropathy.

No conflict of interest

Complications - nerve

P-1369

Screening of diabetic men for erectile dysfunction

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Background: Erectile dysfunction (ED) is one of the commonest complications of diabetes and is associated with co-morbid conditions such as cardiovascular disease, hypertension and depression. ED may also affect quality of life, patient satisfaction, and patient-clinician relationship. Diabetic patients with erectile dysfunction therefore require careful and sympathetic evaluation
The aim of this study is to explore this hidden complication in patients attending our diabetes clinic as very few of them complain of this problem to doctors.
Methods: The subjects are two groups: 1) Patients; 200 consecutive male patients attending the diabetes clinic at Suri Seri Begawan Hospital. They were never treated for sexual problems. 2) Controls; 100 healthy men who are not taking any medication and were screened for hypertension, diabetes and hypercholesterolaemia. (During public screening campaign)
They were asked to answer International Index of Erectile Function (IIEF), to test erectile function, orgasmic function, sexual desire, intercourse satisfaction, overall satisfaction.
The scores of the two groups were compared and a correlation was made between the scores of the patients and their smoking status, BMI, diabetes duration, HbA1c level and the presence of hypertension, hypercholesterolaemia and coronary heart disease
The statistical analysis was done by SPSS Statistics Version 17 software.
Results: The mean age of the diabetic patients was 52±, 9.6. 47% of the diabetic patients were smokers, 85% had associated hypertension and 40% had coronary heart disease.
The diabetic subjects had a lower IIEF score compared with the healthy men, mean 14.65+6.35 vs. 19.17+4.49 (P <0.0001)
The frequency of the different degrees of ED is shown in the table

ED severity	IIEF score	Healthy subjects %	Diabetic patients %
No	1-4	34	19
Mild	5-7	60	47
Moderate	8-11	4	12
Severe	22-25	2	22

The risk of ED was higher in the diabetic patients who are aged more than 50 years; 12.70±6.10 vs. 17.50±5.56 (P <0.0001), diabetes duration of more than 10 years 12.89±6.85 vs. 15.60±5.80 (P 0.009), increased in the presence of associated hypertension; 13.70±6.19 vs. 18.70±5.35 (P < 0.0001) and coronary heart disease 11.06±6.41 vs. 15.76±6.41 (P <0.0001)
There was no significant risk with smoking status; 14.37±0.39 vs. 14.87±6.28 (P 0.617), BMI 14.50±6.13 vs. 14.9±6.63 (P 0.55), HbA1c level 14.57±6.05 vs. 14.73±6.36 (P 0.55) and hypercholesterolaemia 14.54±6.36 vs 14.66±6.17 (P 0.97)
Conclusion: Erectile dysfunction is highly prevalent among the patients attending our clinic, especially among the older patients and those with cardiovascular disease. Therefore every diabetic patient should be screened for ED as few sufferers actually complain of this problem. This is particularly important since there are nowadays a number of effective treatments. Such treatment should become a routine part of any diabetes care service.

No conflict of interest

P-1370

Perception about aetiology of sexual problems, health seeking behavior and treatment for sexual problems among type 2 diabetic men

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Background and objective: Sexual problems i.e low libido, erectile dysfunction (ED), retrograde ejaculation and premature ejaculation are common among type 2 diabetic men. These problems are often under-reported and hardly discussed with the patients by care givers largely because of busy clinic schedule and societal inhibition and norms on issues that border on sexuality, especially in the African communities.Sexual problems compromise multiple aspects of a patient's life, including overall quality of life and interpersonal relationships.
This study examines the perception and understanding of type 2 diabetic men about the aetiology of their sexual problem(s).It also assess their health seeking behavior, treatment practise and outcome.
Methodology: Consecutive 66 type 2 diabetic men attending a diabetic clinic in Jos, Nigeria were interviewed with the aid of a questionnaire on the presence of sexual problem(s) i.e low libido, ED, retrograde ejaculation and premature ejaculation.The erectile domain of the international index of erectile function (IIEF)-15 was also used to assess erectile function.Questions relating to health seeking behavior and treatment were asked from patients found with sexual problems.
Results: Any form of sexual problem was reported in 53 (80.3%) patients, with overall prevalence of ED being 51.5% with the aid of the questionnaire but 87.9% with the IIEF-15. Overall prevalence of low libido, premature ejaculation and retrograde ejaculation were 53%,19.7% and 18.2% respectively. Median duration of sexual problem(s) was 3 years, range (0-12years). In 16 (30.2%) patients sexual problem predate diagnosis of diabetes, and sexual problem was the reason for suspicion and diagnosis of diabetes in 3 (5.7%)patients. Diabetes was the perceived cause of sexual problem(s) in 31 (58.5%) patients. Diabetes medication, stress, old age, hypertension were the perceived cause(s) in 9 (17%) while 13 (24.5%) did not know the cause.Twenty four (45.3%) did not seek for help for reasons ranging from shyness, loss of hope, hope of spontaneous improvement etc. Twenty seven (50.9%) sought for help in the hospital while 2 (3.3%) with the herbalist.Twenty six (49.1%) had used medicine for the sexual problem(s) and some improvement was reported in18 (34%) with or without medicine.Aphrodisiac agents,phosphodiesterase inhibitor (PDE-5) and herbal medicine were used in 10 (18.9%), 9 (17%), and 5 (9.4%) respectively. Eleven (20.7%) did not use medicine because they did not know what to use, twelve (22.6%) because of hope of spontaneous improvement, 2 (3.8%) for fear of drug complication and 2 (3.8%) thought there was no hope of improvement.
Conclusion: Type 2 diabetic men in Jos showed poor perception and understanding of their sexual problems.The health seeking behavior of these patients is also poor. The need for a more holistic approach to management of their sexual problems is more necessary than ever.

No conflict of interest

P-1371

Peripheral neuropathy in diabetes may predispose to distal distribution of atherosclerosis in lower extremities

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Aim: to study the relationship between peripheral neuropathy in the distal nerves (sural/tibial) and arterial plaque formation, blood flow velocity, thrombosis & pattern of flow in femoral popliteal, posterior tibial & dorsalis pedis arteries.
Material and methods: 60 Type 2 DM patients were enrolled
30 patients with peripheral neuropathy comprised test group & 30 patients without neuropathy acted as controls.

Inclusion criterion

- Type-2 DM with peripheral neuropathy
- Type-2 DM without peripheral neuropathy

Exclusion criterion – HT >140/90mm Hg

- Renal dysfunction – S.CREATININE >1.5 mg%
- Buerger's disease
- Gross dyslipidemia
- Chain Smokers

Patients were matched for age, duration of DM, blood sugars and lipids.
Peripheral neuropathy was documented by NSS (Neuropathy Symptoms Score) and NDS (Neuropathy Disability Score) scores>10 as per "Young et al" criterion. Peripheral Vascular Disease (PVD) was documented with Leg Arterial Doppler Study on common femoral, popliteal, posterior tibial and dorsalis pedis arteries by demonstrating

- Plaque Formation
- Change in velocity
- Loss of triphasic flow
- Presence of thrombosis

Results: 1 /30 (3.3%) patients in control group had PVD. While - 8/30 (26.7%) patients in the test group had PVD (p=.012)
Conclusion: Due to large number of complications related to PVD in DM, we suggest that every patient with DM with significant neuropathy should be screened for PVD.

No conflict of interest

P-1372

Erythrocyte plasmalogenes level decreased in diabetes mellitus

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Aims: Cell membranes lipid components are early reflected to changing of homeostasis and conditions and alteration of their content may be early marker of tissue damage. Plasmalogenes presented cell membranes lipid compounds which participate in nerve impulse generation, reception, immune response, transport of substances and present the antioxidant potential of cells. Changing of plasmalogenes level and their significance not clear in Diabetes Mellitus (DM) and present the interest in our study.
Methods: In 67 patients with type 2 DM and 12 healthy subjects (HS), blood glucose fasting (FG) and 2 hour after meal (2HG), HbA1c, total cholesterol (TCh), triglycerides (TG), high and low density lipoproteines (LDL, HDL) levels, blood serum and erythrocytes membranes plasmalogenes (BP, MP) were observed. All patients were examined by neurologist for determining presence and severity of diabetic neuropathy (DN) and divided in groups – with and without DN.
Results: In patients with DM, blood FG, 2HG, HbA1c, TCh, TG, LDL levels were significantly increased and HDL level were decreased in compare with HS and suggest poor glycemic control, whereas BP (11%) and MB (8%) level were significantly decreased in DM patients. Decreasing BP and MP levels had linkage with FG, 2HG, HbA1c, TCh, TG, LDL, HDL levels, and shown dependency from presence and severity of DN, where BP were less in 13.85% ($P<0.05$) and MP – in 9.41% ($P<0.05$) in patients with DN compared without DN. In consider the plasmalogenes rich in nervous tissue this results permit to recommend BP and MP as a biochemical marker of DN.
Conclusion: In patients with DM the levels of BP and MP were significantly decreased and had linkage with glycemia indexes and blood lipids level, and depend from presence and severity of DN.

No conflict of interest

P-1373

The relation of Body Mass Index and Bone Mineral Density in postmenopausal women with type 2 diabetes

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Background: The association between the body weight, height and Bone Mineral Density (BMD) nowadays is extensively researched. The aims of our study was to access the relation between Body Mass Index (BMI) and BMD in postmenopausal type 2 diabetic women, with some symptoms of osteoporosis and prevalence of osteoporosis by WHO criteria.
Methods: This study was conducted on 75 postmenopausal diabetic women at the age of 45-65 years without heavy complications of diabetes. They were divided into 3 groups: Group 1- 24 patients with normal BMI <26 kg/m2; Group 2- 24 overweight patients with BMI from 26 kg/m2 to 30 kg/m2; Group 3- 27 obese patients with BMI >30 kg/m2. Bone mineral density was measured in lumbar spine and femoral neck using dual-energy x-ray absorptiometry.
Results: Patients with obesity had lower prevalence of osteoporosis at the hip (10% vs. 15.5%, p=0.005) or femoral neck (35% vs. 44%, p=0.01) when compared to the patients with normal BMI. Patients with obesity had higher BMD at total hip when compared to the patients with normal BMI ($p<0.001$). There was no statistical difference between the groups 2 and 1, between normal and overweight patients. Overweight patients had slightly, but not statistically significant higher femoral neck BMD and lower lumbar spine BMD, when compared to normal BMI patients.
Conclusion: This study suggests the association of elevated BMI with high BMD and simultaneously, lower prevalence of osteoporosis and fracture risk.

No conflict of interest

P-1374

The effects of electric stimulation with Techtron in diabetes mellitus patients with neuropathy pain

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Objective: To determine the effectiveness of electric stimulation with TECHTRON in the neuropathy pain relief in a group of Diabetes Mellitus patients who were treated in Physical Medicine & Rehabilitation Service at Hermanos Ameijeiras Hospital.
Design: A Clinic prospective research was performed in a group of patients complicated with Diabetes Mellitus type 1 and 2.These patients were sent to the Diabetes Endocrinology Clinic who showed complications as neuropathy pain, confirmed by clinic assessment and electromyography studies. Subjects were randomly assigned in either a control or experimental groups. Analogical Visual Scale (AVS) was applied before and after the treatment in both groups. Low frequency biphasic square wave between 1,1 kHz – 1,6 kHz with TECHTRON equipment manufactured by TECHNO LINK up to 10 minutes daily for 5 weeks was applied in the experimental group1.The control group 2 received TENS current with 200µs/100 Hz up to 10 minutes daily for 5 weeks. Statistical analysis and Mann- Whitney Test were applied.
Result: The mean age was 51,1 in Group 1 and 55,2 in Group 2. The time of evolution of the disease was approximately the double in Group 1 than Group 2 (14,0 and 7,4).Sex in both groups was similar. The prevalence of Diabetes type 2 was relevant in both groups. There is no statistical significance in the average of the percentage of change in the AVS regarding the type of diabetes, sex, age, or the time of evolution of the disease. There was statistical significance (p= 0,03) in the average of the percentages of change in the AVS between treated groups. The lower frequency biphasic square wave with TECHTRON showed more percentage of change for relieve (68%) in the experimental group1.
Conclusion: This study demonstrates that Diabetic Mellitus patients with neuropathy pain are effectively treated with TECHTRON to relieve neuropathy pain.

No conflict of interest

Diabetes and infections

P-1375

New onset diabetes mellitus after liver transplantation and hepatitis C virus infection: meta-analysis of clinical studies

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Aims: New onset diabetes mellitus post liver transplantation is very common and may negatively affect patient and graft survival, but its causative mechanism is still unclear. This study was to analyze the connection between Hepatitis C virus (HCV) infection and new onset diabetes mellitus after liver transplantation by systematically reviewing published medical literature.
Methods: We electronically searched databases of MEDLINE, EMBASE and the Cochrane Library from January 1980 to January 2008. Only retrospective studies could be identified. Seven of them were subjected to the meta-analysis. Analysis was performed by using RevMan 4.2 software.
Results: We found that HCV increased the prevalence of new onset diabetes mellitus [OR 2.46,95%CI (1.44,4.19)]. Then, we further analyzed the association between HCV and persistent new onset diabetes mellitus after liver transplantation. The result showed that prevalence of persistent new onset diabetes mellitus was higher in HCV-positive group than in HCV-negative group with marginal statistical significance [OR=1.39, 95%CI (1.06, 1.83)].
Conclusion: The present meta-analysis based on retrospective studies suggested a significant relationship between HCV and new onset diabetes mellitus after liver transplantation, and it seems HCV infection might also increase the prevalence of persistent new onset diabetes mellitus. Multicenter, large sized prospective studies are still needed to further confirm these results.

No conflict of interest

P-1376

Risk factors for diabetic hand infections

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A case control study of diabetic patients presenting with hand infection in the Philippine General Hospital was performed to determine the correlation of different variables to the development of hand infection in patients with diabetes mellitus (DM). The clinical characteristics and outcomes of diabetic hand infection were described.
Methodology: Clinical characteristics &outcomes of 20 diabetic patients with hand infection (case) were documented. Case patients (N=20) were compared to 60 age and sex-matched diabetic patients without hand infection (control) in terms of educational attainment, occupation, body mass index (BMI), blood pressure, duration of DM, Type 1 vs Type 2 DM, diabetic treatment regimen, blood sugar level control (HbA1c), alcohol intake, tobacco use, incidence of peripheral neuropathy of contralateral hand, presence of arteriovenous (AV) fistula, and intake of immunosuppressants. The odds ratio (OR) and 95% confidence interval (CI) were computed. All variables with P<0.1 identified by bivariate analysis were evaluated by multiple logistic regression analysis to identify independent risk factors for infection (P<0.05).
Results: Case patients had a mean age of 48.65 +/- 7.59 years and a 1:4 female to male ratio. Ninety-five percent were manual laborers with type 2 diabetes for a median of 3 years. Seventy percent were being maintained on oral hypoglycemic agents. Only 10% had adequate glucose control. The nondominant hand was infected in 45% of patients. Infection in 85% was localized to a single digit but was deep in 80% of cases. The median treatment delay was 15 days. All patients had to undergo surgical debridement at time of presentation. An average of 2.1 surgeries were done for each patient. Average time to wound healing was 8.5 days +/- 6.19. Amputation rate was 80%. Average length of hospitalization was 17.4+/- 10.3 days.
Significant variables identified after bivariate analysis were college education, BMI ≤/- 20, HbA1c >7, insulin treatment, tobacco use, and alcoholic beverage consumption. After multivariate analysis, tobacco use was identified as an independent risk factor (OR=30, CI= 1.3, 691.5, P<0.034). Low BMI (P<0.08) and poor glucose control (P<0.08) were strongly associated with infection but did not reach statistical significance.
Conclusion: Diabetic hand infection in the local population was associated with significant morbidity. Prevention efforts should be focused on diabetic patients who are smokers and have a low body mass index. Adequate glucose control should be stressed. Patients should be educated to seek immediate consult following minor hand trauma or at the onset of symptoms.

No conflict of interest

P-1377

Periodontitis and association of cytokine gene polymorphism in type 2 diabetes in Sri Lanka

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Aims: To examine Periodontal Associated Genotype (PAG) as a risk factor in periodontitis in patients with type 2 diabetes in a suburban population in Sri Lanka
Introduction: PAG defined by the presence of allele 2 of both IL1A +4854 and IL1B +3954 polymorphisms, is a significant predictor for chronic periodontitis in some but not in all populations studied. Type 2 diabetes is also recognised as a risk factor for periodontal disease.
Method: 262 patients with type 2 diabetes and 72 sex and age matched controls underwent periodontal examination. Polymerase chain reaction (PCR) followed by restriction fragment length polymorphism (RFLP) allelic discrimination was employed to genotype (IL1A +4854) and (IL1B +3954) polymorphisms.
Results: 12.6% and 12.5% of subjects were reported to be PAG positive from type 2 diabetes and control groups respectively. The distribution between the two groups was not statistically significant (c^2 =0.983). 38.9% (130/334) of the total cohort were found to be periodontally healthy of whom 13.1% (17/130) were PAG positive. 27.8% (93/334) and 32.3% (108/334) had gingivitis and chronic periodontitis respectively. 16.1% of subjects with gingivitis and 9.3% of chronic periodontitis group were PAG positive. PAG was associated with mean probing depth (p=0.039) and mean loss of attachment (p=0.05). The presence of PAG has no significant association with smoking (p = 0.582).
Conclusions: PAG had no significant association with periodontits in patients with type 2 diabetes and controls. PAG positive percentage (12.6%) is relatively low in this population compared to Caucasians. PAG status as a significant predictor for periodontal disease remains controversial.

No conflict of interest

P-1378

Relationship of oral conditions and factors in type 2 diabetes mellitus patients

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Aims: Type 2 diabetes mellitus was already reported to be correlated pathogenesis of periodontal disease. Furthermore,hyperglycemia may worsen the periodontal disease, caused by infectious condition, immunocompromise and disturbance of microcirculation.Therefore, we have studied the relationship between complications of periodontal status severity and diabetic several factors.
Methods: Seventy six type 2 diabetic out-patients were selected at Tokyo Dental College Ichikawa General Hospital. Clinical and laboratory examinations have observed age, sex, BMI, duration of diabetes, prevalence of retinopathy, existence of hypertension, current treatment for diabetes, level of HbA1c and LDL-cholesterol, HDL-cholesterol, triglyceride. Oral examination and periodontitis condition were evaluated in diabetic patients. Residual teeth,

bleeding on probing (BOP), plaque control record (PCR) and pocketing were observed. Moreover, Panoramic radiograph was used for alveolar bone resorption assessment.
Results: In this study, average of BOP was recognized 37.8% and average of PCR was recognized 44.4%.These percentages of periodontitis were higher in diabetics compared to normal population. Poor diabetic control, examined by HbA1c, was related to increase the periodontitis status and progression of periodontitis. Prevalence of diabetic retinopathy was recognized to have the tendency to worsen the periodontitis.
Conclusions: The existance of retinopathy and poor diabetic control is related to worsening of the periodontal disease in type 2 diabetes mellitus patients.

No conflict of interest

P-1379

Diagnostic value of LDH-enzyme and efficacy of treatment with SPS-bacteriophages in children with newly diagnosed type 1 diabetes and gingivitis

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Background and aims: The aim of the present work was to assess the microflora of the mouth cavity; diagnostic value of the LDH-enzyme activity measured in the mixed saliva, and uses of highly effective polyvalent bacteriophages in gingivitis – a periodontal disease in children with newly diagnosed type 1 diabetes (T1DM).
Materials and methods: Totally, 40 children with fresh T1DM (girls 26/boys 14, mean age 10.5±0.75yrs) were enrolled in the study group (Gr.1). Practically healthy children (n=25, mean age 9.1±0.92yrs) were used as controls (Gr.2). Disk – diffuse method was used to determine sensitivity of micro-organisms toward antibiotics, and Fiscal standard method – for SPS bacteriophages sensitivity. SCE method was used to assess LDH-enzyme activity.
Results: Changes in mouth cavity microflora that are expressed in quantitative growth of conditionally pathogenic microbes in association with fungus Candida Albicans, namely St. haemoliticus – 46.6%, and SPS bacteriophages sensitivity – 70% were observed in children with newly diagnosed T1DM. In Gr. 1 LDH-enzyme activity in the mixed saliva was 1426±78 IU/l (p=0.05), while in Gr. 2 it was 339.26±14.75 IU/l.
Conclusion: 1. It is important to enroll in the treatment scheme of the periodontal diseases, namely gingivitis the highly effective, polyvalent, SPS bacteriophages, that are prepared taking into account the microbial strains revealed while investigating the mouth cavity microflora of children with T1DM. 2. It is necessary to add assessment of the mixed saliva LDH-enzyme activity to the algorithm of the periodontal disease examinations in children with newly diagnosed T1DM.

No conflict of interest

P-1380

Effect of hepatitis C virus infection on metabolic and cardiovascular risk profiles of diabetic patients

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Aims: The aims of this study were to:
1. Determine the prevalence of Hepatitis C virus infection in diabetic patients.
2. Elucidate the presence of an association between diabetes and hepatitis by comparing prevalence in diabetics with controls.
3. Determine the effect of Hepatitis C virus infection on metabolic and cardiovascular risk profiles of diabetic patients.

Methods: Five hundred and fifty diabetic patients attending diabetes clinic were enrolled in the study. Patients' data was collected after taking consent. A control group comprising of 550 healthy blood donors who donated blood in blood bank of hospital during the study period were taken as controls. Hepatitis C virus antibody presence was checked using ELISA in both control and study group. Patients' glycemic control was checked and lipid profile was analyzed. Blood pressure, body mass index (BMI) and waist-hip ratio (WHR) were measured. All the ethical requirements were met before starting the study.
Results: The age of patients was 47.58 years and the duration of diabetes was 7.02 years. Out of 550 patients included in study, 304 were female, 428 were from urban locality and 143 had a positive family history of diabetes mellitus. HCV infection was present in 160 (29.09%) diabetic patients as compared to control in whom prevalence was 8.18% (OR=4.60, 95% CI= 3.22-6.57, p<0.01). Patients with HCV infection had significantly lower total serum cholesterol, serum triglycerides, LDL cholesterol, LDL cholesterol/HDL cholesterol ratio and a lower waist to hip ratio as compared to diabetic patients without HCV infection. In contrast, they had significantly higher random blood sugar value. Furthermore, diabetic patients with HCV infection had insignificantly lower HDL cholesterol, fasting blood glucose and HbA_1c level. They also had insignificantly higher systolic blood pressure, diastolic blood pressure and BMI when compared with diabetic patients who tested negative for HCV infection.
Conclusion: The study shows that there is a possible association between HCV infection and diabetes. Although HCV infection is associated with high random blood sugar values, the remaining metabolic and cardiovascular risk indicators show a favorable pattern. It is an intriguing finding as HCV infection has been shown to induce insulin resistance compounding diabetes course but in this case, it had a positive influence on the metabolic and cardiovascular risk profiles of diabetic patients.

No conflict of interest

P-1381

Characteristics and outcome of patients with recurrent tuberculosis in diabetic patients

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Diabetes mellitus is an immunocompromised state that is shadowed infection with tuberculosis. Little data are available regarding characteristics of recurrence in those patients. Thirty eight registered diabetic patients with recurrent pulmonary TB between July 2002 and June 2007 were evaluated. Our aim was to determine 1) the characteristics, management and treatment outcome, 2) timing of the previous episode of TB, and 3) pattern of drug resistance in patients registered with recurrent smear-positive pulmonary TB. Retrospective data collection using TB registers and laboratory culture and drug sensitivity registers were examined. We found that there were 2 years or less between completing and re-starting treatment in 38 diabetic patients. Only 22 patients had sputum sent for culture and drug sensitivity tests. In 21 patients with cultures of Mycobacterium tuberculosis, 16 were fully sensitive, 3 had resistance to isoniazid and/or streptomycin, and 2 had resistance to isoniazid and rifampicin (MDR-TB). We can conclude that diabetic patients with recurrent TB had acceptable treatment outcomes, and most had fully sensitive organisms. Over half had recurrent TB 2 years or less after completing treatment. Ways to prevent recurrence need to be investigated and implemented in the field.

No conflict of interest

Glycated haemoglobin

P-1382

Changes in glycosylated hemoglobin levels among managed care dyslipidemia patients with type 2 diabetes treated with niacin extended-release plus statin versus other lipid therapies

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Aim: To compare changes in glycemic regulation in patients with type 2 diabetes (T2D) and dyslipidemia treated with niacin extended-release + any statin (NER+S), ezetimibe + any statin (E+S), or statin monotherapy (SM) in a managed care setting.
Methods: Retrospective analysis of the HealthCore Integrated Research Database was performed on patients aged ≥18 years, diagnosed with dyslipidemia and T2D, minimum of 12-month pre- and post-index health plan eligibility, and newly initiating NER+S, E+S, or SM therapy between 1/1/2000-6/30/2006 (index date). Comparisons included mean change in HbA1c level and percent (%) of patients achieving < 7% HbA1c from baseline (12 months prior to index date) to 1-year post-index between the study cohorts. Multivariate regression analysis estimated change in HbA1c level after adjusting for differences in age, gender, prior cardiovascular disease (CVD), hypertension, baseline HbA1c, and pre- and post-index average daily dose of

insulin, oral and other injectable anti-diabetic medications (incretin mimetics).
Results: A total of 2,441 patients were identified, 204 NER+S, 343 E+S, and 1,894 SM. SM patients were significantly younger (51.7 ± 9.7 vs. 54.3 ± 9.4 years; p<0.05), comprised of fewer males (50.8% vs. 69.1%; p<0.05), and were less likely to have had prior hypertension (77.6% vs. 92.2%; p<0.05) and CVD (13.8% vs. 34.3%; p<0.05) versus NER+S patients. E+S patients had similar demography and were less likely to have had prior CVD (23.6% vs. 34.3%; p<0.05) versus NER+S patients. Percent change in average daily dose in oral and injectable anti-diabetic medication use from pre- to post-index period were found to be statistically non-significant between the study cohorts. Except for the E+S group, other treatment groups demonstrated an unadjusted mean reduction in HbA1c level from baseline to 1-year post-index (6.93±1.24 vs. 7.05±1.42: NER+S; 7.33±1.66 vs. 7.29±1.71: E+S; 7.39±1.77 vs. 7.6±2.03: SM). Multivariate analysis showed no statistical difference in the mean change of HbA1c levels between NER+S and other study cohorts (NER+S vs. E+S; p=0.1448 and NER+S vs. SM; p=0.3313). Post-index achievement of HbA1c goal < 7% was observed accordingly: NER+S (61.3%), E+S (51.0%), and SM (51.3%); p=0.0235.
Conclusions: Despite managed care patients with T2D and dyslipidemia receiving NER+S being older, sicker, and thus with potentially more risk factors, comparable changes in mean HbA1c levels and HbA1c goal attainment compared to E+S and SM therapies at Year 1 after initiating therapy even after adjusting for baseline HbA1c and anti-diabetic medication use were seen. Further research on long-term clinical and economic impact of different dyslipidemia therapies in patients with diabetes is warranted.

Conflict of interest:
Stock ownership: Abbott Laboratories Stock Ownership: Sanjeev Balu, Abbott Laboratories Robert Simko, Abbott Laboratories Mark Cziraky, HealthCore Inc. Ralph Quimbo, HealthCore Inc.
Employee: Abbott Laboratories Employees: Sanjeev Balu Robert Simko
Commercially-sponsored research: This study was sponsored by Abbott Laboratories.

P-1383

Evaluation of apolipoproteinB-48 (ApoB-48) by chemiluminescence enzyme immuno-assay

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Objectives: Serum lipid disorder is one of important risk factors that contribute to atherosclerosis. It is shown that postrandial hypertriglyceridemia has a great influence on it. Recently there are a few reports that serum apolipoprotein (ApoB-48) levels reflect serum triglyceride levels after a meal. The aims of this study are to measure fasting serum Apo B-48 levels in the patients with Type 2 diabetes mellitus and to evaluate the relationship between them and diabetic control marker.
Subjects and methods: We measured serum fasting levels of total cholesterol, HDL-cholesterol, LDL-cholesterol, triglyceride (TG), Apo-B48, blood sugar, and hemoglobinA1c (HbA1c) in 579 patients (346 men, 233 women; age 65.2±12.4 years old) with Type 2 diabetes mellitus. ApoB-48 values were measured by chemiluminescence enzyme assay.
Results: We classified the whole of patients into L group with Apo-48 under 13 μg/ml and H group with more than 13 μg/ml, based on a report of Yamashita et al that defined as abnormal when the value exceeds 13 μg/ml, and compared HbA1c and serum triglyceride levels between both groups. Four hundred seventy-four patients were in the L group, 105 patients were in the H group. HbA1c levels were 6.9+1.1 %, 7.3+1.4%, and serum TG levels were 110.5±63.6 mg/dl, 277.3±141.2 mg/dl respectively. Both HbA1c and serum TG levels were significantly higher in the H group than in the L group (P <0.01). We analyzed in patients with normal TG levels under 150mg/dl. Three hundred ninety-two patients were in the L group and 13 patients were in the H group. HbA1c levels were 6.8±1.0%, 7.5±1.5% (P <0.01), and serum TG levels were 89.5±30.1mg/dl, 102.1±26.3 mg/dl (P <0.01)respectively. Both levels were significantly higher in H group.
Discussion: In the whole ApoB-48 high group of patients, there was a lot of both glucose impairment and lipid disorder. In the patients with normal triglyceride levels, a similar tendency was shown. This is suggested that we need to control serum triglyceride levels strictly as well as glycemic contol for prevention of atherosclerosis in the diabetic patients, especially in the patients with ApoB-48 high level.

No conflict of interest

P-1384

Prevalence of suspected hemoglobin variants amongst patients in the Diabetes Centre at Tan Tock Seng Hospital

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Introduction: Glycated hemoglobin (gHb), measured as hemoglobin (Hb)A_{1c}, provides a common means for assessing long-term glycemic control in patients with diabetes mellitus (DM) and it correlates well with the risk of developing DM-related complications. The number 1c following HbA represents the order in which this hemoglobin is detected on chromatography. The presence of Hb variants can adversely affect the accuracy of HbA_{1c} measurements, providing misleading in formation regarding the state of glycaemic control in the patient. However, the extent of Hb variants remains unclear.
Objective: This study aims to determine the prevalence of suspected Hb variants amongst DM patients from the DM Clinic at our centre.
Methodology: We undertook a retrospective review of patients who had HbA_{1c} test done in the Diabetes Centre at Tan Tock Seng Hospital from 15 May 2008 to 28 February 2009. The inclusion criteria were any patient with DM who had a Point-of-Care HbA1c performed using the fully automated D-10™ Hemoglobin Testing Analyzers from Bio-Rad Laboratories. This test utilizes the High Performance Liquid Chromatography (HPLC) method for HbA_{1c} analysis.
Patient variables such as age, gender, and racial categorizations were captured and the chromatogram generated by the analyzers were obtained. The chromatogram displays the possibility of Hb variant(s) by showing abnormal peaks such as 'unknown' peak after A_0, variant - window peak after A_0, S-window, 'unknown' peak before A_{1b}, 'unknown' peak before A_{1a} of >2%, 'unknown' peak between A_{1a} and A_{1b} of >2% or abnormal increase in HbF.
Results: 3171 patients' HbA_{1c} data were reviewed. The range of HbA1c was 2.1% - 17.7% and mean HbA1c was 8.2%. 53 % were females and the mean age of the patients were 62, and 69% were Chinese,14% were Malay, 12% Indian and 4% of other races.
5.8% of patients had chromatograms with additional or abnormal peaks, indicating the possible presence of Hb variants.
Discussion: This preliminary study suggests that the prevalence of suspected Hb variants among patients with DM in our practice is significant. Most HPLC systems are not able to resolve additional peaks in their chromatograms which may result in results which do not correlate well with the average glycaemic control over the preceding weeks. This has implications for clinicians who are always pushing to get the HbA1c to target. If the Hb variants are contributing to under-reading, we would be too complacent in our management exposing patients to excessive risk. If the variants were contributing to over-reading, we would potentially be exposing patients to the harm of hypoglycaemia. Further studies will be required to confirm the suspected Hb variants present in each chromatogram and the effects of each Hb variant on the %HbA_{1c} value determined by analyzers.

No conflict of interest

P-1385

Glycated albumin is affected by hemoglobin concentration and body mass index in adult normal glucose tolerance

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Aims: HbA1c measurement is usually used to reflect time-averaged glycemic control, because HbA1c has been used in a number of studies on glucose control and diabetic complications as a surrogate marker for risk; however, the assays have not been standardized, and commercial laboratories use different methods. Moreover, the amount of HbA1c reflects the glycemic control of a patient during the 6- to 8-week period before the blood sample was obtained. Glycated albumin (GA) is a glycemic control marker, and the assays have been standardized by enzyme assay. GA levels should provide useful information on

glycemic control when monitoring the effects of therapy, because GA reflects the glycemic control of a patient during a 2-week period; however, GA is also influenced by the turnover of serum albumin. To further elucidate the influence on GA, we investigated the influence factors of GA in adult normal glucose tolerance.

Methods: A 75g oral glucose tolerance test was performed using 719 dry-dock subjects without a past history of diabetes. Of those, 534 (male: female = 330:224) with normal glucose tolerance (NGT) were enrolled. The mean subject age of NGT was 51.3 ± 8.6 years, mean body mass index (BMI) 23.2 ± 3.2 kg/m^2, mean HbA1c 5.0 ± 0.3 % and mean GA 14.5 ± 1.2 %.

Glycated albumin was measured with reagents from Asahi Kasei Pharma (Luccia GA-L enzymatic assay; AKP, Tokyo, Japan). Student's t test, analysis of variance (ANOVA), or the Chi-squared test was used where indicated.

Results: Mean fasting plasma glucose (FPG) was 93.8 ± 7.0 mg/dl, mean post-loading plasma glucose one hour later was 135.7 ± 36.3 mg/dl, and mean post-loading plasma glucose two hours later was 106.3 ± 17.9 mg/dl. Fasting serum immunoreactive insulin of NGT was 6.5 ± 3.7 IU/l. In NGT, GA correlated with age (R=0.1807), HbA1c (R=0.1614), BMI (R=-0.3178), IRI (R=-0.2649), HOMA-IR (R=-0.2532), HOMA-b (R=-0.2649), albumin (R=-0.0941), and hemoglobin (R=-0.4092).

Multivariate stepwise linear regression analysis was performed to identify independent determinants of GA levels. In NGT, multivariate stepwise linear regression analysis indicated that hemoglobin (p<0.0001), BMI (p<0.0001), HbA1c (p=0.0303), age (p=0.0004), HOMA-b (p=0.0074), and post-loading 1-hour PG (p=0.0158) were independent determinates of GA. In IGT, multivariate stepwise linear regression analysis indicated only HbA1c (p<0.0001), BMI (p=0.0162). Also in DM, multivariate stepwise linear regression analysis indicated fasting plasma glucose and post-loading 2-hour PG.

Conclusion: Hemoglobin and BMI were more influencing factors than age or PG in adult normal glucose tolerance.

No conflict of interest

In-patient care

P-1386

Point prevalence of type 2 diabetes mellitus in a Nigerian urban tertiary hospital

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Background: Type 2 diabetes mellitus (DM) is assuming epidemic proportions worldwide. Its contribution to clinical workload and healthcare cost is enormous and varies from country to country. DM may present to medical, surgical, obstetric/gynaecological or other disciplines. Previous studies have tended to limit the prevalence of DM admission to medical wards.

Aim: To assess the burden of DM to in-patient care in an urban teaching hospital in Nigeria.

Methods: We surveyed on a particular day, all adult patients on admission in a 700-bedded hospital. Information obtained about each patient included age, sex, indication for admission and duration of hospital stay as at time of survey. Paediatric and psychiatric wards were excluded. Results are presented as frequencies (%) and mean (SD). Level of statistical significance is set as $p \leq 0.05$.

Results: A total of 260 patients were on admission as at the time of survey, consisting of 154 (59.2%) females and 106 (40.8%) males. The mean age of the patients was 40.1 (15.5) years. The patients with DM were significantly older than the patients without DM {58.2 (13.9) v 37.8 (14.1), p=0.0000}. The mean duration of hospital stay for all the patients was 28.3 (53.5) days. The overall point prevalence of DM was 30 (11.5 %) made up of 20 (66.7%) females and 10 (33.3%) males. The prevalence of DM patients in the medical wards was 18 (28.1%) while in the other wards the prevalence rates were surgical 6 (5.4%); gynaecology/obstetrics, 4 (7.3%); and accident/emergency (A/E) wards, 2 (7.1%). Diabetes mellitus foot syndrome (DMFS) constituted 9 (30.0 %) of all the DM patients. Three (10.0 %) of the patients had gestational diabetes. The mean duration of stay on admission for the diabetes patients was 13.4 (14.2) days while for non DM patients, it was 30.3 (56.3) days, p=0.1.

Conclusion: The study shows that DM constitutes a major drain on healthcare resources in urban Nigeria. DMFS has the highest prevalence amongst diabetes admissions. The reasons for the high rate of diabetes admissions require further studies.

No conflict of interest

P-1387

Pattern of admissions in a tropical endocrine in-patient service in Lagos, Nigeria

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Background: Diabetes mellitus is the commonest endocrine disorder. It is treated by both endocrinologists and diabetologists. However, we do not know how much of the endocrinologist's time is devoted to diabetes as compared to other medical and endocrine disorders.

Aim: To determine the contribution of diabetes mellitus and related disorders to the in-patient work-load of a medical endocrine service in Nigeria.

Method: We analysed the Unit records for in-patients in a medical endocrine unit over an 18-month period. The information retrieved from the records included age, sex, diagnosis, date of admission, date of disposal and outcome. Results were presented as means (SD) and frequencies (percentages). The level of statistical significance is set at $p = 0.05$.

Results: A total number of 275 patients were admitted during the period of study. Of these, 137 (49.8%) were males and 138 (50.1%) were females. Their mean age was 40.0 years. Endocrine cases accounted for 78 (28.4%) while the non-endocrine cases accounted for 197 (71.6%) of the patients.

Of the endocrine in-patient admissions 70 (91.0%) were for diabetes mellitus. Thirty-six (51.4%) of them were male and 34 (48.6%) werefemale. The mean duration of admission for all patients was 17.8 days, with a range of 1 to 106 days, while the mean duration of stay for diabetic patients was 19.3 days.

The burden of diabetic admissions was 7 (10%) for hyperglycaemic emergencies, 24 (34.3%) for diabetes mellitus foot syndrome, and 39 (55.7%) for other diabetic conditions.A total number of 65 (24%) deaths were recorded. Of these, 7 (9.9%) were diabetic.

Conclusion: Tropical endocrine practice consists of about 50% of general medical problems and about 50% of general endocrine disorders. Of the endocrine disorders diabetes mellitus occupies a preeminent position. It accounts for a large proportion of the disabilities and mortality among endocrine in-patients. Many of the causes of such deaths are preventable. This calls for preventive measures to be instituted.

No conflict of interest

P-1388

Are we managing inpatient hyperglycemia appropriately?

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Background: Improving diabetes control among inpatients is a priority. Diabetes affects up to 40% of hospitalized patients and is associated with poor inpatient outcomes. To date research in the non-critically ill patient population has focused primarily on glycemic control and short-term inpatient outcomes as opposed to process of care and long-term outpatient outcomes.

Objectives: The objectives of this study were to 1) determine whether diabetic care was appropriate for a representative sample of medicine and surgery patients, 2) describe important processes of care for diabetic patients, and 3) determine whether appropriate diabetic care was associated with better post-discharge outcomes.

Study Design: This study was a secondary analysis of the Ottawa-Outcomes After Hospitalization (OATH) Study, a cohort study designed to assess the association of continuity of care with patient outcomes.

Setting: The Ottawa Hospital, a university-based multi-campus hospital located in Ottawa, Ontario, Canada.

Patient Population: 167 medical and surgical patients with type 1 or type 2 diabetes identified in the medical record.

Interventions: Patients were interviewed and their charts reviewed to identify demographics, diagnoses, co-morbidities, functional status and in-hospital diabetes management. Appropriateness of diabetes management was determined by three physicians using a review process guided by implicit and explicit criteria. We performed structured telephone interviews at 1, 3, and 6 months to identify repeat emergency visits, readmissions, and deaths. Univariate and multivariate analyses were used to assess whether appropriateness of diabetes management was associated with post-hospital outcomes (time to

emergency room visit, rehospitalization or death).
Results/Outcomes: 27% of patients were judged as having inappropriate in-hospital diabetes management. Patients with inappropriate care had higher mean blood glucose levels [11.9 mmol/L (10.1-15) vs 8.5 mmol/L (7.3-11.1), p<0.01], more hyperglycemia (blood glucose >11.1mmol/L) [median 51% (IQR 35-72) vs 40% (IQR 14-67), p<0.01], and less frequent adjustment of treatment in response to hyperglycemia (7% vs 29%, p<0.01). 57% (CI 49-64%) of patients had at least one post-discharge outcome, but a diagnosis of type 2 diabetes was the only baseline factor associated with increased post-discharge outcomes. In multivariate analyses, there was a trend towards the delivery of inappropriate care in hospital with time to post-discharge adverse outcome (OR 1.4, p=0.1).
Conclusions: Based on our results, over one quarter of non-critically ill medical and surgical patients have inappropriate in-hospital diabetes management. Further research is needed to determine the association between in-patient diabetic management and post-discharge outcomes.

No conflict of interest

P-1389

Perceptions of sliding scale insulin regimens amongst medical trainees are not reflected in diabetes management in hospital

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Background: Improved glycemic control in hospitalized patients favourably impacts outcomes and reduces complications in those with established or newly-diagnosed diabetes. In-hospital glycemic targets are rarely achieved and increase morbidity and length of stay. Diabetes management in teaching hospitals is often left to medical trainees who frequently use sliding scale insulin (SSI) regimens. Unfortunately, SSI protocols are reactive and often result in erratic glycemic patterns. Regimens using basal insulin prescription may be more effective at achieving glycemic control but are infrequently used.
Aim: To determine medical residents' attitudes to inpatient diabetes management and SSI use, and whether these perceptions are reflected in practice.
Methods: 1. Questionnaires were distributed to Internal Medicine residents on medical teaching units (MTUs) to determine their comfort with treating diabetic patients and opinions on SSI prescribing practices. 2. A retrospective record audit of diabetes management on the MTU over a 3 month period, concurrent with the questionnaire survey was undertaken.
Results: 40/70 questionnaires were completed. 85% of residents were "comfortable" or "very comfortable" managing uncomplicated diabetes in hospital. Substantially fewer residents feel the same managing diabetic patients who were not eating and pre or post-operative (58% and 38%, respectively). SSI was reported as the most frequently prescribed regimen by 73% of residents with only 10% "often"choosing a basal/bolus protocol. 30% of residents felt SSI was "often" used appropriately. 40% of residents felt recommended glucose targets were "rarely met" with the current prescribing practices. Reasons for selecting SSI for diabetes management were recorded.
134 diabetic patients were admitted to the MTU (of 420 total admissions). Over 84% of diabetic patients received SSI (mean duration of SSI=6.9days). The SSI protocol was adjusted once, on average, prior to discharge, and 43% of prescriptions were never adjusted. 63% of patients had an order for basal insulin. Average length of stay was longer if the patient was prescribed SSI (12.0 days) vs all diabetic patients (11.0 days).
Conclusions: Residents feel comfortable managing inpatient hyperglycemia, are aware of glycemic targets and are familiar with different insulin formulations. Residents recognize that SSI are utilized often, though inappropriately and result in poor glycemic profiles. Evaluation of admissions to the MTU revealed that the prescription of SSI exceeds residents' predictions, and that SSI doses are adjusted very infrequently. This may contribute to poor glycemic control while in hospital and appears to negatively impact length of stay.

No conflict of interest

P-1390

Impact of an intensive insulin therapy protocol in the blood glucose control of diabetic patients undergoing cardiovascular surgery

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Background and aims: Hyperglycemia is a predictor for the development of complications in postoperative period of diabetic patients undergoing cardiovascular surgery. Appropriate glucose control in postoperative period would reduce hospital mortality and morbidity. We evaluated a specific protocol of intensive insulin therapy. The primary aim was to determine the impact on the metabolic control and the secondary aim was to evaluate death and morbidity in these patients.
Materials and methods: Two cohorts of inpatients were evaluated. A cohort (control group) of 212 patient with diabetes undergoing cardiovascular surgery from June of 2004 to June 2005 with blood glucose control without algorithm nor objective of control predetermined, and a cohort (intensive insulin therapy group) of 347 patient with diabetes undergoing cardiovascular surgery from June 2006 to June 2008 with objectives of strict blood glucose control (glucose level < 120 mg/dl) through a specific protocol using continuous intravenous insulin infusion in the first 48 hours of the postoperative period and later subcutaneous insulin until discharge.
Results: The intensive insulin therapy group had higher prevalence of male, obesity and higher scores Euroscore. The cardiovascular bypass time was longer compared with the control group. The mean blood glucose level decreased significantly in the cohort intensified in intensive care unit (189,51 +/- 30,97 vs 132,19 +/- 20,52 ; p 0,05) and during the inpatient clinic (183,49 +/- 42,7 vs 141,09 +/- 19,99; p 0,05). There was no significant difference between the two groups in hospital mortality (4, 7% vs 6,3%; p: ns), mediastinitis (4, 7% vs 5,2%; p: ns) as other complications, even after adjustment for Euroscore.
Conclusions: The protocol of intensive insulin therapy was effective in obtaining a better metabolic control in patients with diabetes undergoing cardiovascular surgery. However we could not show any reduction of postoperative complications during the intensive treatment, possibly due to the smaller population. These observations must be validated in a larger population.

No conflict of interest

P-1391

The triple - B (Basal-Bolus-Booster) subcutaneous insulin regimen: a user friendly protocol for management of in-hospital hyperglycaemia

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Aims: Hyperglycemia in hospitalised patients is common, a problem aggravated by intercurrent illness, interference by investigations, changes in oral intake and lack of time and understanding by health professionals. Sliding scale insulin remains the most common treatment, with all its inherent problems. The real challenge is to find a protocol which is possible for hospital staff to follow logistically and safely. We piloted and systematically evaluated a Triple B (Basal-Bolus-Booster) insulin regimen.
Method: Basal insulin (glargine, 0.2 unit/kg/day for Type 1, cardiac or body weight<60kg patients, 0.25 unit/kg/day for others) was given in the evening. Bolus insulin (aspart or lispro 0.2-0.25units/kg/day) was given in 3 equally divided pre-meal doses but withheld in patients not eating full meals. Booster insulin (aspart or lispro) was given up to 4 times daily according to 4 daily BGLs performed at pre-specified times. Inpatients with existing diabetes (n=42, 98% Type 2) were treated for a median of 5 days (IQR 3-7). Their initial HbA1c was 10.4±2.4% (mean, SD) and their in-hospital glycaemic control to require commencement or substantial adjustment of insulin therapy. Another 171

patients were sufficiently hyperglycaemic but not included due to short hospital stay or concurrent conditions thought not suitable at this pilot phase. Patients were allowed to remain on oral anti-hyperglycaemic agents. Education about the Protocol, typically in 1-2 sessions of 15 minutes, was given to the ward staff. A member of the study team evaluated (i) compliance with the protocol {by comparing the number (n) of actual BGL measurements and insulin injections with the number potentially required, adjusted for duration of stay and absence due to investigations} (ii) the safety of the protocol {% of BGL at pre-specified times <4 or >15mmol/L} and (iii) the efficacy according to the mean daily BGL.
Results:

	Compliance			Safety	
	BGL	Basal&Bolus	Booster	BGL<4	BGL>15
Actual (n)	20+7	19+7	9+6	median 0%	median 9%
Potential (n)	21+8	20+7	15+8	mean 2.2%	mean 17%

The BGL (mmol/L, mean±SD) on successive days were: 13.2±4.7, 11.9±3.8, 11.1±2.9, 10.4±3.2, 11.2±3.1, 10.4±3.2, 10.8±2.9 (t_{trend}, p=0.01). There were no hypo or hyperglycaemic crises requiring withdrawal from the protocol.
Conclusion: Treatment of acutely ill diabetic inpatients with this Triple B regimen resulted in significant improvement in glycemic control with minimal adverse events. Staff were able to implement the protocol after just a modest amount of education with good compliance in determining BGLs and in giving insulin at pre-specified times and dosages. However, they were hesitant to give additional insulin to correct for hyperglycaemia. Further education and the use of the Triple B acronym emphasising the Booster component would hopefully improve this. The Triple B regimen seems to be widely applicable, safe and efficacious.

No conflict of interest

P-1392

Intensive perioperative glycemic control with glargine in a group of perioperative patients with type 2 diabetes mellitus

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Aims: Intensive perioperative glycemic control of patients with type 2 diabetes mellitus is crucial for the prognosis of surgical operation, especially for those who need to be fasting during pre- and post-operative period. Insulin glargine is the most possible replacement of basal insulin because of its surgeless time-action curve Our study is to explore the possibility and advantages of insulin glargine therapy in the perioperative glycemic control of type 2 diabetic patients.
Methods: We retrospectively analyzed the clinical data of 16 type 2 diabetic inpatients treated with insulin glargine (study group) and 16 type 2 diabetic inpatients treated with the conventional intensive insulin therapy (control group). Several days (usually 1~4 days) before the operation, each patient of study group accepted the intensive therapy including insulin glargine at 7 am and regular insulin before each meal, whereas on the operation day, the preoperative dose of insulin glargine was applied only. After the operation, insulin glargine was still applied as basal insulin and its dose was adjusted according to the value of fasting blood glucose. In the control group, patients accepted the intensive insulin therapy including NPH injection at bedtime and regular insulin before each meal. After the operation the continuous intravenous insulin was applied instead of the subcutaneous injection in the control group.
Results: The fasting blood glucose values of diabetic patients in the study group on the operation day and the first 3 postoperative days were 7.5±1.8mmol/l and 8.2±1.8mmol/l, 7.6±1.6mmol/l, 7.2±1.1mmol/l, respectively; while 9.0±2.8mmol/l and 10.4±2.4mmol/l, 8.8±2.7mmol/l, 9.0±2.0mmol/l in the control group, respectively. The fasting blood glucose values in the study group were significantly lower than in the control group on the postoperative day 1 and day 3 (p=0.02 and 0.01, respectively). No hypoglycemia events occurred and all wounds healed well in both groups.
Conclusion: With satisfying fasting blood glucose level and possibly fewer episode of hypoglycemia, perioperative glycemic control by insulin glargine in type 2 diabetic patients is proved safe, effective and convenient.

No conflict of interest

P-1393

Is analogue insulin better in hospitalized patients? A non-intervational investigator initiated study in a tertiary care hospital in India

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Background: Glycaemic control plays a paramount role in outcome of the patients admitted to the hospital. We have documented before that diabetes control in hospitalized people is not good in general.
Aims and objectives: The primary objective of the study was to find out whether analogue Insulin is better than conventional in hospitalized patients. Secondary objectives were to compare incidence of hypoglycaemia, duration of stay and Insulin dose.
Materials and methods: Patients were stared on Insulin as required in routine management, every alternate case was started with conventional (regular human, NPH Insulin and premix) and analogue (Aspart, Detemir and premix Aspart) Insulin. For the purpose of this study the target blood glucose were – [80-140 mg% on IV Insulin/GIK regimen and pre-meal 80-120, postmeal and bedtime 120-180 on SC insulin]. We defined 'good control' as 80% or more blood glucose results within the target range, 'sub-optimal control' as 40-80% and rest as 'poor control'. While on SC Insulin, if the control was good for two consecutive days the Insulin regimen was downgraded, i.e. two doses of premix Insulin, be it conventional or analogue. On the other hand if control was poor or if any two sugar value in a day were above 300 mg%, rescue regimen, i.e. three doses of premix Insulin were used. Treatment satisfaction was assessed with DTSQ at the time of discharge.
Results: The current cohort is the first 70 cases (34 conventional, 36 analogue) from the ongoing project. Mean age, sex, duration of Diabetes, sugar and HbA1C at admission did not vary in the two groups. Two received IV insulin (one in each arm, control was good in both), 32 received GIK regimen for an average period of 30 hrs (16 in each arm: 9 of the 16 in the conventional arm had good, 7 suboptimal control while 12 were in good control with analogue Insulin and the rest 4 suboptimal).Average fasting glucose on SC Insulin was 139 with conventional and 140 with analogue (P=NS) Insulin, average premeal glucose was 178 and 157 mg% respectively (P 0.001). Average postmeal glucose was 225 with conventional and 171 mg% with analogue (P 0.0001). In 17% patient in the analogue group mean blood glucose was <140mg while none with conventional. There was no difference in the daily requirement short acting Insulin in the two groups but average requirement of basal Insulin was less with analogue Insulin (13 vs 18 unit, P 0.003). There were 3 cases of mild hypoglycaemia in 3 patients (2 with analogue). Rescue regimen was used in 10 with conventional as opposed to 1 with analogue, the similar number for downgrading was 18 and 14 respectively. Treatment satisfaction did not vary in the groups (DTSQ 25 vs 27, P NS).
Conclusion: Our data suggests analogue Insulin could be better in people admitted to hospital, we need a bigger cohort to substantiate our observation.

No conflict of interest

P-1394

Efficacy of a novel nurse driven multidisciplinary protocol for transition from intravenous to subcutaneous insulin after cardiac surgery

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Aim: The use of continuous insulin infusion (CII) for glycemic control for at least 3 days after cardiac surgery reduces morbidity and mortality. We aim to study the efficacy of a novel protocol for subcutaneous (SQ) insulin administration in a basal/prandial regimen in cardiac surgery patients, to transition from CII to SQ insulin at the first oral feeding after surgery, with a target blood glucose of a daily mean of ≤ 150 mg/dL. The protocol is novel in that it is driven by usual nursing staff and unspecialized physicians.
Methods: In the protocol, the initial dose of basal insulin is based on the hourly CII rate required for glycemic control during 6 hours prior to transition. Our CII protocol target glucose is 120 mg/dL. Prandial insulin is based on patient weight. Correction supplemental insulin dose is specified. Blood glucose is obtained at mealtimes, 10pm and 3am. A simple algorithm is used once every morning to adjust insulin doses according to point of care blood

glucose results from the preceding 24 hours. We retrospectively analyzed data in 59 consecutive cardiac surgery patients enrolled in the Protocol to evaluate efficacy in achieving a target blood glucose ≤ 150 mg/dL for 5 days after cardiac surgery.

Results: 32 diabetics and 27 nondiabetics were studied. Diabetics had a greater BMI than non diabetics (29.8 vs 26.0 kg/m^2, p<0.004). The mean duration of CII was 26.6 h (range:7-74, SD:12). 71% of patients extubated the day after surgery received SQ insulin within 6 hours of extubation.

The mean CII rate for 6 hours prior to first oral feeding was similar in diabetics and nondiabetics (2.2 vs 2.4 U/h) as were the mean initial doses of basal insulin (35.1 vs 30.2 U) and mean daily basal insulin doses for protocol days 1-5 (34.7 vs 35.3 U) respectively. The mean prandial insulin dose was 6.0 Units in nondiabetics and 6.5 Units in diabetics patients, p=ns for all.

Mean daily blood glucose for all patients for up to 5 days after surgery was 128.8 mg/dL. This was higher for diabetics than nondiabetics on days 1-5 (143 vs 117 mg/dl), day 1 (144.6 mg/dL vs 124.6) and day 2 (144.2 mg/dL vs 121.2 mg/dL), p<0.05 for all.

80% of patients achieved the 5-day protocol target of mean daily blood glucose of ≤ 150 mg/dL. This was achieved in significantly more nondiabetics than diabetics: 97% vs 59 on days 1-5; 94% vs 63% on protocol days 1 and 2. (p<0.05)

Discussion: Our protocol is effective for glycemic control in cardiac surgery patients. Diabetics require a higher initial dose of SQ basal insulin at transition from CII than predicted solely from the CII infusion rate required prior to beginning oral feeding. We incorporated this interesting finding into a modified protocol; an efficacy study of this is currently underway.

No conflict of interest

Incretin therapies

P-1395

Safety of vildagliptin in patients with mild renal impairment and patients with normal renal function: GALIANT study

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Aim: To assess the safety profile of vildagliptin (Vilda) compared to thiazolidinediones (TZD) as add-on to metformin (MET) in patients with type 2 diabetes (T2DM) with renal impairment (RI) and with normal kidney function.

Methods: Adverse event (AE) data from a randomized, 12-week, open-label study comparing Vilda 100 mg and TZD (agent and dose at the investigators' discretion) as add-on therapy in pts with T2DM inadequately controlled (HbA_{1c}: 7–10%) on a stable dose of MET (≥1000 mg/day) monotherapy were analyzed (GALIANT Study). Glomerular filtration rate (GFR) was calculated by the MDRD method (cutoff of >50 to ≤80 ml/min/1.73^2 defined as mild RI).

Results: Of 2627 pts randomized in a 2:1 ratio (Vilda + MET: n=1756; TZD + MET: n=871), 1278 pts in the Vilda + MET and 635 in the TZD + MET groups had normal renal function (mean duration of T2DM: 4.9 years both groups; mean GFR: 136.4 and 135.5, respectively), and 463 in the Vilda + MET and 230 in the TZD + MET groups had mild RI (mean duration of T2DM: 5.6 years both groups: mean GFR: 71.3 and 70.7, respectively). The number of pts with moderate RI (n=14) was too small to allow for a meaningful interpretation. The incidence of the most common AEs (>2% of pts in any treatment group) was:

	Normal renal function		Mild RI	
	Vilda + MET n=1278	TZD + MET n=635	Vilda + MET n=463	TZD + MET n=230
ALL	40.1	34.8	37.8	40.4
Headache	4.4	2.2	3.2	2.2
Dizziness	2.0	2.2	2.8	3.0
URI	2.0	1.4	1.3	3.0
Nausea	2.9	2.0	2.8	2.2
Diarrhea	2.6	2.5	1.5	2.2
Peripheral edema	0.5	2.0	0.6	2.6
Fatigue	1.6	1.7	2.2	0.9
Rash	1.4	0.3	2.2	0
Arthralgia	0.7	1.1	1.1	2.2
Vomiting	0.9	0.8	1.1	2.2
Bronchitis	1.3	1.1	0.9	2.2

A higher incidence of headache and rash was noted in both Vilda + MET groups, while those with mild RI receiving TZD + MET experienced a higher incidence of peripheral edema and URI. The rash observed was mild and resolved while receiving study drug. For 18 and 10 pts with rash receiving Vilda + MET with normal renal function and mild RI, respectively, rash was reported as possibly related to study drug in only 2 (0.2%) pts and 2 (0.4%) pts, respectively. For pts with normal renal function, 26 (2.0%) in the Vilda + MET and 21 (3.3%) in the TZD + MET groups discontinued due to AEs, while in the groups with mild RI 13 (2.8%) and 7 (3.0%), respectively, withdrew due to AEs. A slightly higher incidence of serious AEs was noted in both TZD + MET groups (normal: 2.4%; mild RI: 3.0%) compared with the Vilda + MET groups (normal: 1.6%; mild RI: 2.4%). For pts with mild RI and normal transaminase levels at baseline, there were no significant imbalances noted at the end of the study between the Vilda + Met and TZD + Met groups (ALT: 3.1% and 1.1%, p=0.2365; AST: 3.0% and 1.4%, p=0.2831, respectively).

Conclusion: The safety profile in pts with mild RI was similar to that noted in pts with normal renal function receiving Vilda + MET or TZD+ MET.

Conflict of interest:
Paid lecturing: Mary Ann Banerji, MD, is on the Speakers Bureau for Merck, Takeda, Sanofi Aventis, and Novartis Pharmaceuticals
Advisory board: Mary Ann Banerji, MD, is on the Advisory Boards for Novartis Pharmaceuticals, Sanofi Aventis, and Bristol Meyers Squibb
Employee: Bruce H Francis, MD, and Das Purkayastha are employees of Novartis Pharmaceuticals Corporation
Commercially-sponsored research: Novartis Pharmaceuticals Corporation
Other substantive relationships: Mary Ann Banerji, MD, has received research grants from Takeda and Novartis Pharmaceuticals

P-1396

Taspoglutide, a novel human once-weekly GLP-1 analogue, improves islet integrity and protects ß cell function in ZDF rats

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Aims: Evidence suggests that incretin therapies may have protective effects on ß-cell function, which is progressively lost in Type 2 diabetes (T2D). Here, we evaluated the effect of the novel, long-acting human GLP-1 analogue taspoglutide (R1583) on islet physiology in Zucker diabetic fatty (ZDF) rats, a model of T2D.

Methods: Quantitative analysis of islet morphology and in situ pancreas perfusion were performed to assess islet structure and function after single application of taspoglutide (1 mg, sc, formulated to mimic human exposure) or vehicle to 6-week-old male ZDF rats. Pancreata harvested from 9-week-old animals after 3 weeks of treatment were stained with specific antibodies for insulin (ß-cells) and glucagon (a-cells).

Results: Treatment of ZDF rats with taspoglutide protected islet integrity as demonstrated by 1) reduced number of abnormally enlarged islets [area of islet section (µm^2) >120,000: 9.8% (vehicle) vs 3.7% (taspoglutide); >50,000 and <120,000: 17.6% (vehicle) vs 10.8% (taspoglutide); mean islet area (µm^2): 43,692±2356 (vehicle) vs 23,680±1464 (taspoglutide), p<0.0001. 2) prevention of loss of insulin-staining intensity [pixel intensity: 83±11.3 (vehicle) vs 100.4±1 (taspoglutide), p<0.0001; with relative change from prediabetic 5-week old ZDF rats of -18.5% (vehicle) and -4.1% (taspoglutide)]. 3) prevention of a-cell invasion from islet periphery to core [% invading a-cells to total a-cells: 26.5±1.2 (vehicle) vs 10.6±0.7 (taspoglutide), p<0.001; with relative change from prediabetic 6-week-old ZDF rats of 340% (vehicle) and 76.5% (taspoglutide)]. Pancreas function was improved in 9–10-week-old ZDF rats treated with taspoglutide, as measured by levels of glucose-stimulated insulin secretion by perfused pancreata in low (2.8 mM) or high (16.7 mM) glucose concentration. In particular, basal insulin secretion at 2.8 mM glucose was reduced [88.8±8.6 (vehicle) vs 18.7±7.6 ng/ml (taspoglutide), p<0.01] and Phase I + Phase II AUC were normalized [406±42 (vehicle) vs 214±44 ng/ml•min (taspoglutide), p<0.05].

Conclusion: Single administration of taspoglutide to ZDF rats protected islet architecture and limited decline in islet function. Preservation of islet integrity and ß cell function with taspoglutide might provide substantial benefits in preventing progression of T2D.

Conflict of interest:
Advisory board: Claes Wollheim (for F. Hoffman-La Roche)
Employee: Agnes Bénardeau, Sabine Uhles, Olga Ivanova, Sabine Sewing, Hayian Wang, Mathieu Brecheisen, Cristiano Migliorini, Elena Sebokova (all employees of F. Hoffman-La Roche), Lola Tobalina (employee of Ipsen Pharma)
Commercially-sponsored research: Domenico Bosco (research contract from F. Hoffman-La Roche)

P-1397

Two years of treatment with liraglutide, a human GLP-1 analogue, offers sustained and greater reduction with HbA1c, FPG, PPG and weight compared with glimepiride, with lower glycaemic risk, in patients with type 2 diabetes: LEAD-3 extension study

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Aims: In the 1-year, randomised, double-blind, LEAD-3 study, patients with type 2 diabetes (n=746) receiving liraglutide monotherapy, 1.2 or 1.8 mg OD, achieved greater reductions in HbA_{1c}, FPG, weight, hypoglycaemia and systolic blood pressure than those taking glimepiride (8 mg OD). The present study, an open-label extension, analysed the efficacy and tolerability of liraglutide, compared with glimepiride, during a further year (2-year extension).
Methods: A total of 90% (n=440) of 1-year completers entered the randomised, double-blind, open-label extension period of the LEAD-3 study, of whom 321 (73%) completed a further year of treatment (2-year completers: mean age=54 years, HbA_{1c}=8.2%; median diabetes duration=3.3 years; BMI=33kg/m^2; diet/exercise only at LEAD-3 entry=36%; 1 OAD=64%) Data presented are for 2-year completers.
Results: Compared with glimepiride, 2 years of liraglutide treatment, (1.8 or 1.2 mg) resulted in significantly greater reduction in HbA_{1c} (-1.1 and -0.9%, vs -0.6%; ANCOVA; p=0.0016 and p=0.0376, respectively) and lower final HbA_{1c} (6.9 ± 1.2 and 7.1 ± 1.2% vs 7.5 ± 1.2%). A greater proportion of liraglutide subjects reached HbA_{1c} < 7.0% (58 and 53% vs 37%; p=0.0054 and p=0.0269, respectively). Liraglutide also reduced FPG more effectively than glimepiride (1.5 and 1.3 vs 0.3 mmol/L, respectively) and achieved lower mean daily PPG (-2.6 and -1.9 vs -1.8 mmol/L; p=0.01 for liraglutide 1.8 mg vs glimepiride and vs liraglutide 1.2 mg) and post-breakfast PPG (p=0.0001 for liraglutide 1.8 mg vs. glimepiride). Weight loss at 1 year associated with liraglutide and weight gain with glimepiride were maintained (-2.7 and -2.1 kg vs + 1.1 kg; p < 0.0001). Hypoglycaemia (BG < 3.1 mmol/L) was reduced by at least 85% with liraglutide 1.8 mg/day (0.28 and 0.16 vs 1.82 events/subject/year; p=0.0001 and p < 0.0001). Differences in HbA_{1c} between completers and the ITT (LOCF) population were comparable; ITT (LOCF) analyses also showed significantly greater reductions in FPG, PPG, weight and hypoglycaemia with liraglutide vs glimepiride.
Conclusion: Two years of liraglutide monotherapy leads to significantly greater reductions in HbA_{1c}, FPG, PPG and body weight than glimepiride, with lower hypoglycaemic risk.

Conflict of interest:
Paid lecturing: Henry, Garber, Bode: Novo Nordisk
Advisory board: Garber: Novo Nordisk
Employee: Hale, Chang: Novo Nordisk
Commercially-sponsored research: Henry, Bode: Novo Nordisk
Other substantive relationships: Henry, Garber, Bode: Novo Nordisk (consultant fees)

P-1398

Improvement in HbA1c with liraglutide, a human GLP-1 analogue, is not dependent on the degree of patient weight loss

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Aims: There have been suggestions that the ability to induce weight loss might explain some of the improvement in HbA_{1c} observed with GLP-1 receptor agonists. Therefore, this meta-analysis compared HbA_{1c} reduction with liraglutide 1.8 mg daily to determine whether the improvement was related to weight loss.
Materials and methods: A meta-analysis of six phase 3 randomised controlled trials including 2739 patients with type 2 diabetes compared HbA_{1c} reduction among patients in different categories of weight change from baseline (weight gain, weight loss ≥0 to ≤3%, weight loss >3 to ≤5%, and weight loss >5%), during treatment with liraglutide 1.8 mg daily or placebo. Endpoints were assessed after 26 weeks.
Results: More patients treated with liraglutide (76%) lost weight from baseline compared with placebo (60%). Twenty-four per cent of patients in the liraglutide group experienced >5% weight loss versus 10% of patients in the placebo group. Weight loss of >3% to ≤5% occurred in 17% of patients in the liraglutide group and in 13% with placebo. Thirty-five per cent and 37% of patients in the liraglutide and placebo groups, respectively, had weight change of 0 to 3%. Liraglutide induced significant reductions in least-squared (LS)-mean HbA_{1c} from baseline in all weight change groups compared with the placebo group (p<0.0001; Table 1). The effect of liraglutide on change in HbA_{1c} was independent of weight loss category (p=0.71).
Conclusions: Liraglutide induced weight loss in a greater percentage of patients than placebo and almost a quarter of patients treated with liraglutide had >5% weight loss. Liraglutide was associated with significantly improved reductions in HbA_{1c} compared with placebo that was independent of weight loss category. Thus, liraglutide independently affects both HbA_{1c} and weight in patients with type 2 diabetes.

HbA_{1c} reductions according to weight change category

	Percentage HbA_{1c} reductions from baseline (patient no., %)			
	Weight loss from baseline category (%)			
Treatment	Weight gain or no weight change from baseline	≥0 to ≤3%	>3 to ≤5%	>5%
Liraglutide 1.8 mg daily	–1.38* (327, 24%)	–1.29* (470, 35%)	–1.43* (224, 17%)	–1.65* (318, 24%)
Placebo	–0.33 (210, 40%)	–0.23 (192, 37%)	–0.16 (65, 13%)	–0.70 (52, 10%)

*p < 0.0001 versus placebo.

Conflict of interest:
Paid lecturing: W Schmidt, Lecturing for Novo Nordisk S Madsbad, Speaker, Novo Nordisk G Sesti, Speaker, Novo Nordisk
Advisory board: S Gough, Advisory board, Novo Nordisk S Madsbad, Advisor, Novo Nordisk
Employee: A Falahati, Employee Novo Nordisk AD Toft, Employee Novo Nordisk
Commercially-sponsored research: B Zinman, Research support, Novo Nordisk

P-1399

Enhanced glycaemic efficacy of liraglutide in patients with highest beta-cell function compared to glimepiride

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Aims: The sulphonylureas (SU), a widely used oral treatment for type 2 diabetes, stimulate release of insulin from pancreatic beta-cells. The newly developed incretin-based therapies, glucagon-like peptide (GLP)-1 agonists, such as liraglutide, differ from SUs in that they promote glucose-dependent insulin secretion from the beta-cells in addition to having beta-cell preserving properties. Treatment with liraglutide is associated with weight loss and a reduced risk of hypoglycaemia compared to SUs. The aim of this report is to compare the efficacy (HbA_{1c}) of liraglutide (1.2 mg or 1.8 mg/day) and the SU, glimepiride in relation to patients' beta-cell function.
Methods: A meta-analysis was performed on HbA_{1c} efficacy data from six randomised controlled 26-week trials in which patients were treated with liraglutide 1.8 mg (n=1362), liraglutide 1.2 mg (n=896) or glimepiride (n=490). An ANCOVA model adjusted by quartile of beta-cell function at baseline (as defined by HOMA-B) and C-peptide was used to compare the effects of drug treatment on HbA_{1c} change from baseline.
Results: In the liraglutide groups the reduction in HbA_{1c} was significantly ($p<0.01$) greater than with glimepiride with reductions of 1.4%, 1.3% and 1.1% for 1.8 mg, 1.2 mg liraglutide and glimepiride, respectively. Both liraglutide doses reduced HbA_{1c} significantly across all quartiles of HOMA-B and C-peptide (1.0% and >1.2%, respectively). When analysed by quartiles of baseline HOMA-B, reductions of HbA_{1c} with liraglutide were significantly greater ($p<0.05$) than with glimepiride in the 2nd (0.23% [SE=0.12], 0.28% [0.11] for 1.2 mg and 1.8 mg vs glimepiride) and 4th quartile (0.42% [0.11], 0.40% [0.11] for 1.2 mg and 1.8 mg vs glimepiride). For quartiles of baseline C-peptide the greatest reductions ($p<0.05$) with liraglutide compared to glimepiride were observed in the 3rd (0.31% [0.12], 0.31% [0.1] for 1.2 mg and 1.8 mg vs glimepiride) and 4th (0.24 % [0.12], 0.40% [0.11] for 1.2 and 1.8 mg vs glimepiride) quartiles. Liraglutide produced the greatest improvements in HbA_{1c} in patients with the highest baseline beta-cell function (Q4). No effect of baseline quartile on HbA_{1c} reduction was seen with glimepiride.
Conclusions: Liraglutide was effective across the range of beta-cell activity. The greatest improvements in HbA_{1c} occurred in patients with the most preserved beta-cell function, supporting that clinical benefit may be gained when treatment is started early in the disease process.

Conflict of interest:
Paid lecturing: DR Matthews, J Meier - Novo Nordisk
Advisory board: J Meier - Novo Nordisk
Employee: A Falahati, AD Toft - Novo Nordisk

P-1400

HbA1c reduction with liraglutide in patients with type 2 diabetes is associated with initial HbA1c levels

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Aim: The once-daily human GLP-1 receptor agonist liraglutide has been shown to be more effective at reducing HbA_{1c} than other OAD therapies. We analysed data from a meta-analysis of six development trials to establish the effect of initial baseline HbA_{1c} levels on subsequent improvement in glycaemic control with liraglutide.
Methods: The meta-analysis was performed on data from the six LEAD trials (n=3967). Patients receiving liraglutide 1.8 mg, TZD, SU, glargine, exenatide or placebo in the LEAD trials were split into six categories according to initial baseline HbA_{1c} level: ≤7.5%, 7.5–8.0%, 8.0–8.5%, 8.5–9.0%, 9.0–10.0%, >10.0%. Reduction of HbA_{1c} compared to baseline for each category was determined and statistical analysis of change in HbA_{1c} from baseline to week 26 was performed by ANCOVA on the LOCF, ITT data set.
Results: At 26 weeks liraglutide 1.8 mg demonstrated reductions in HbA_{1c} relative to baseline for each baseline category, with greater reductions associated with higher baseline HbA_{1c} categories (Table 1). These reductions ranged from 0.89% for the ≤7.5% category to 2.50% for the >10.0% category. Significantly greater reductions were observed for liraglutide 1.8 mg vs TZD in categories 8.0–8.5% (0.40%), 8.5–9.0% (0.86%), 9.0–10.0% (0.96%) and >10.0% (1.14%); vs SU in categories ≤7.5% (0.24%), 8.0–8.5% (0.21%), 8.5–9.0% (0.13%) and >10.0% (0.56%); vs glargine in categories ≤7.5% (0.34%), 7.5–8.0% (0.19%) and 9.0–10.0% (0.15%); vs exenatide in categories ≤7.5% (0.31%) and 9.0–10.0% (0.06%); vs placebo in categories ≤7.5% (0.86%), 8.0–8.5% (1.14%), 8.5–9.0% (1.25%) and >10.0% (1.72%); $p<0.0001$ for each.
Conclusions: Clinically relevant reductions in HbA_{1c} were achieved with liraglutide 1.8 mg for all categories of HbA_{1c} baseline. Reductions in HbA_{1c} were increased in subjects with poorer levels of initial glycaemic control and were significantly greater than active comparators. Liraglutide 1.8 mg can help patients achieve target HbA_{1c} levels at various stages of disease progression.

LS-Mean of change in HbA_{1c} by baseline category of HbA_{1c}						
	Reduction in HbA_{1c} at 26 weeks relative to baseline (%)					
HbA_{1c} baseline (%)	Liraglutide 1.8 mg	TZD	SU	Glargine	Exenatide	Placebo
≤7.5	0.89	0.57	0.65	0.55	0.58	0.03
7.5–8.0	1.11	0.62	0.88	0.92	0.85	0.24
8.0–8.5	1.31	0.91	1.10	1.15	1.08	0.17
8.5–9.0	1.64	0.78	1.51	1.33	1.25	0.39
9.0–10.0	1.82	0.86	1.42	1.67	1.76	0.43
>10.0	2.50	1.36	1.94	2.29	1.28	0.77

Conflict of interest:
Stock ownership: Toft: Novo Nordisk
Advisory board: Nauck, Hermansen: Novo Nordisk
Employee: Vaag, Falahati, Toft: Novo Nordisk
Other substantive relationships: Nauck, Hermansen: Novo Nordisk (consulting fees)

P-1401

Adding liraglutide to existing therapy improves glycaemic control: evidence from a meta-analysis of six large randomised clinical trials

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Aims: Worsening glycaemic control associated with the progression of type 2 diabetes is typically addressed by adding additional drugs to existing therapy in routine clinical practice. Liraglutide, a once-daily human glucagon-like peptide-1 (GLP-1) analogue, was tested alone or in combination with various therapies, including diet/exercise, in six randomised, controlled phase 3 trials in 4442 patients.
Materials and methods: Meta-analysis using logistic regression of the subset of patients who maintained their pre-trial regimen of oral antidiabetic drugs during these trials (n=1683) investigated the efficacy of adding liraglutide to existing therapy. Only those patients who maintained their pre-trial regimen, and added liraglutide, were included. Existing therapy was diet and exercise in one trial, metformin or SU in two trials, metformin+SU in two trials and metformin+TZD in one trial. The effect on HbA_{1c}, FPG, body weight (BW) and systolic blood pressure (SBP) was assessed for liraglutide 1.8 mg, liraglutide 1.2 mg, and placebo.
Results: ANCOVA analysis of the effect of adding liraglutide 1.8 mg and 1.2 mg to existing therapy showed statistically significant mean reductions in HbA_{1c} from baseline: 1.5% (liraglutide 1.8 mg) and 1.3% (liraglutide 1.2 mg); $p<0.0001$ for both groups. The reduction in HbA_{1c} from baseline with placebo was 0.3% (summary statistics, see Table). As add-on therapy compared to placebo, liraglutide 1.8 mg and 1.2 mg reduced HbA_{1c} by 1.2% and 1.0%, respectively ($p<0.0001$ for both). Liraglutide as add-on therapy reduced HbA_{1c} to 7.0% (liraglutide 1.8 mg) and 7.1% (liraglutide 1.2 mg), while placebo

as add-on reduced HbA_{1c} to 8.0%. Proportions of subjects (with 95% CIs) reaching target HbA_{1c}<7% with liraglutide as add-on were 71% [65%; 75%] for liraglutide 1.8 mg; 59% [51%; 67%] for liraglutide 1.2 mg; and 18% [12%; 26%] for placebo. The odds-ratio of reaching target HbA_{1c} <7% with add-on therapy of liraglutide 1.8 mg vs liraglutide 1.2 mg was 1.7 (p=0.0202). Reductions in FPG were reported for both liraglutide 1.8 mg and 1.2 mg as add-on, and improvements in BW and SBP were also observed (Table).

Conclusion: Liraglutide as add-on to existing therapy leads to greater improvements in glycaemic control than previously observed in individual trials where background treatment was changed in many subjects.

Comparison of liraglutide with placebo, as add-on therapy (summary statistics)					
		HbA_{1c} (%)	FPG (mmol/L)	BW (kg)	SBP (mmHg)
Liraglutide 1.8 mg	Baseline	8.3	9.6	90.0	132.0
	End of trial	7.0	7.7	88.0	129.0
	Change	-1.4	-1.8	-2.2	-2.9
Liraglutide 1.2 mg	Baseline	8.3	9.5	89.3	128.6
	End of trial	7.1	7.7	88.1	127.0
	Change	-1.3	-1.7	-1.4	-1.4
Placebo	Baseline	8.3	9.3	89.1	132.4
	End of trial	8.0	9.8	88.7	131.8
	Change	-0.3	0.5	-0.4	-0.4
Add-on group includes subjects on prior SU in LEAD 1, prior met in LEAD 2, prior diet/exercise in LEAD 3, prior met and TZD in LEAD 4, prior met and SU in LEAD 5, and all subjects in LEAD 6. Data are ITT LOCF.					

Conflict of interest:
Paid lecturing: Pratley: Novo Nordisk
Advisory board: Pratley, Nauck: Novo Nordisk
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Commercially-sponsored research: Pratley: Novo Nordisk
Other substantive relationships: Pratley, Nauck, Holst: Novo Nordisk (consultant fees)

P-1402

Sustained glycaemic control with 2 years' liraglutide and glimepiride treatment (both combined with metformin), achieved with weight loss and less hypoglycaemia with liraglutide: data from the LEAD-2 trial

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Aims: In patients with T2D (n=1091), 6 months' treatment with liraglutide, a once-daily (OD) human GLP-1 analogue, vs glimepiride (both combined with metformin) resulted in similar glycaemic control, but lower weight, reduced hypoglycaemia and improved SBP with liraglutide; data from the LEAD-2 1.5-year extension.

Methods: Subjects were randomised to liraglutide OD (0.6, 1.2, or 1.8 mg) +met, met alone [met], or met+glimepiride (4mg OD) [glim]. Met dose 1.5–2 g/day. First 6 months were double blind, double-dummy, thereafter open-label.

Results: 89% (780 subjects) of 26-week completers entered the extension; 529 (68%) completed 2 years (mean age 55 years; BMI 30 kg/m^2; HbA_{1c} 8.2%; diabetes duration 6 years). HbA_{1c} in subjects on 1 OAD before trial entry (35%) was improved and sustained for 2 years. At 2 years, HbA_{1c} (ITT, LOCF) was 7.38%, 7.44%, 7.74% for liraglutide 1.8, 1.2, 0.6 mg; 7.49% for glim and 8.12% for met (p=NS for liraglutide 1.8 mg vs glim). In the total cohort (ITT, LOCF), proportion reaching HbA_{1c}<7.0% at 2 years was 31.1%, 29.9%, 19.7% for liraglutide 1.8, 1.2, 0.6 mg; 23.5% for glim and 10.8% for met (p<0.0001 liraglutide 1.8 mg vs glim). Liraglutide-treated patients also achieved significant and sustained weight loss (1.8 mg: -2.91 kg; 1.2 mg: -3.03 kg; 0.6 mg: -2.07 kg) vs weight gain for glim (+0.7 kg; p<0.0001 vs all liraglutide doses). With liraglutide, waist circumference was significantly reduced from baseline by 1.8–2.8 cm at 2 years vs an increase with glim (+0.2 cm; p≤0.0001). Mean visceral adipose tissue area was reduced by 18 and 13 cm^2 with liraglutide 1.2 and 1.8 mg and increased by 9 and 2 cm^2 with met and glim, measured by single-slice abdominal CT scan (p=NS between groups). Hypoglycaemia with liraglutide was similar to met but only one tenth of that with glim; events/subject year: 0.15 (each liraglutide dose); 0.16 (met) and 1.60 (glim; p<0.0001 vs all liraglutide doses). Odds-ratio for achieving composite endpoint of HbA_{1c}<7.0%, no weight gain and no hypoglycaemia for liraglutide 1.8 mg was 4.9 vs glim and 3.8 vs met (p<0.001 and p=0.0002).

Conclusion: Over 2 years, liraglutide+met resulted in similar improvements in HbA_{1c} as glim+met. With liraglutide, however, this was achieved with only one tenth the hypoglycaemia with glim and sustained ~3 kg weight loss vs a small weight gain with glim.

Conflict of interest:
Paid lecturing: Matthews: Novo Nordisk
Advisory board: Hermansen, Nauck: Novo Nordisk
Employee: Zdravkovic: Novo Nordisk
Other substantive relationships: Nauck, Hermansen: Novo Nordisk (consulting fees) Shah, Tankova, Mitha: Novo Nordisk (Principal Investigators)

P-1403

Improved patient-reported outcomes following treatment for type 2 diabetes with liraglutide compared with exenatide, in addition to metformin, sulphonylurea or both

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Aims: Complexity in type 2 diabetes (T2D) treatment regimens often eclipses the positive effects of improved glycaemic control on health-related quality of life. Novel T2D therapies should improve both glycaemic control and patient satisfaction. Here, we report treatment satisfaction from patient-reported outcomes (PRO) examined in a clinical trial on patients with T2D randomised to the once-daily (OD) human glucagon-like peptide-1 (GLP-1) analogue liraglutide or the twice-daily (BID) GLP-1 receptor agonist exenatide.

Methods: Liraglutide Effect and Action in Diabetes (LEAD) 6 was a 26-week, open-label study of 464 patients with patients and HbA_{1c} of 7–11%, randomised to liraglutide 1.8mg OD or exenatide 10µg BID on a metformin±sulphonylurea therapy background. A subgroup of 379 patients had PRO examined using two versions of the Diabetes Treatment Satisfaction Questionnaire (DTSQ): status (DTSQs) at Weeks 0 and 26, and change (DTSQc) at Week 26. In a 14-week extension, patients continued or switched to liraglutide 1.8mg; 313 answered the DTSQs at Weeks 34 and 40 and the DTSQc at Week 34.

Results: From Weeks 0–26, liraglutide achieved a significantly greater reduction in HbA_{1c} relative to exenatide, and a significantly lower rate of minor hypoglycaemia. Concurrently, liraglutide increased overall treatment satisfaction on the DTSQs more than exenatide (27.4–32.1 vs. 27.6–29.0, respectively, p<0.0001). Overall satisfaction on the DTSQc increased more with liraglutide than exenatide at Week 26 (p=0.0004). At Week 26, more patients rated themselves 'satisfied' (DTSQs score >24; DTSQc score >6) with liraglutide than exenatide (DTSQs 91% vs. 82%, p=0.0173; DTSQc 94% vs. 86%, p=0.0176). Liraglutide improved all DTSQs and DTSQc items except 'diabetes understanding' significantly more than exenatide by Week 26. Relative to exenatide at Week 26, significant reductions in DTSQc score were seen for liraglutide in perceived hypoglycaemia (-0.88 vs. -0.44; p=0.0193) and hyperglycaemia (-0.99 vs. -0.33; p=0.0007). By the end of the extension at Week 40, DTSQs scores in those switched from exenatide to liraglutide at Week 26 approached scores of non-switched patients, due to a larger rise in score from Weeks 26–40 (p=0.0028). DTSQs scores remained stable in non-switched patients from Weeks 26–40.

Conclusion: Overall treatment satisfaction among patients with T2D is greater with liraglutide than exenatide at Week 26, and increases from Weeks 26–40 in patients switched to liraglutide relative to non-switchers.

Conflict of interest:
Stock ownership: J Buse owns shares in Insulet.
Advisory board: JS Christiansen, advisory panels and speakers bureau for Novo Nordisk, Pfizer, Roche and Novartis.J Buse is a consultant, investigator and/or speaker for Amylin, Lilly, Novo, Roche, Novartis, Pfizer, sanofi-aventis, GlaxoSmithKline
Employee: M Hammer, Employee Novo Nordisk.MJ Zychma, Employee Novo Nordisk.
Commercially-sponsored research: WE Schmidt, $10K: Grant support: Eli Lilly, Novartis.
Other substantive relationships: WE Schmidt, Roche, Novartis, Eli Lilly, NovoNordisk, Schering-Plough, Takeda, AstraZeneca, Eisai, Merck Sharp and Dohme, Falk Foundation, Bristol Meyers Squibb, Berlin Chemie.

P-1404

Liraglutide pharmacokinetic profile following SC dosing is unaltered by co-administration with sitagliptin in Göttingen minipigs

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Background and aims: Liraglutide is a once-daily human Glucagon-Like Peptide-1 (GLP-1) analog that has completed phase 3 clinical testing. Liraglutide is a fatty-acid derived analog of human GLP-1 that binds to albumin as its main mechanism of protraction. Liraglutide is also stabilized against the DPP-IV enzyme. However, liraglutide is subject to a minor degradation in vivo, and thus it is interesting if co-administration with a DPP-IV inhibitor leads to increases in liraglutide concentrations. Sitagliptin is a DPP-IV inhibitor that increases endogenous levels of GLP-1, which is the main mechanism for its blood glucose lowering ability. Since both compounds lead to increases in GLP-1-like concentrations (either liraglutide or native GLP-1), we investigated if they could be combined by investigating the pharmacokinetics of liraglutide following co-administration of liraglutide and sitagliptin.
Materials and methods: The study was carried out in minipigs because only pigs have a similar absorption of injectable peptide analogs as compared to humans. Sitagliptin is dosed once daily PO (100 mg) in patients, resulting in a steady state trough plasma concentration of 41 ng/mL. Liraglutide is dosed once-daily SC (1.2 or 1.8 mg). The study was conducted in two parallel groups (+/- sitagliptin) of mini-pigs (n=4). Both groups were dosed SC with liraglutide in a dose of 2 nmol/kg, equivalent to app. 0.6 mg per 75 kg. The sitagliptin group was dosed three times daily in order to obtain a target steady state trough plasma concentration of sitagliptin above 40 ng/mL.
Results: The key pharmacokinetic parameters (mean ±SD) of liraglutide are given in Table 1. Sitagliptin had no significant effect on the pharmacokinetics of liraglutide as evaluated by T_{max}, C_{max}, AUC/Dose and half-life. The mean plasma concentration of sitagliptin was verified to be above 40 ng/mL.
Conclusion: In conclusion, the DPP-IV inhibitor sitagliptin did not alter the pharmacokinetics of liraglutide following SC administration in mini-pigs.
Table 1

Treatment	Tmax [hr]	Cmax [pM]	AUC/Dose [hr·pM/pmol/kg]	T* [hr]
- Sitagliptin	8.5 ±2.5	18000 ±3700	278 ±32	22 ±2.6
+ Sitagliptin	8.0 ±2.8	19600 ±2300	322 ±53	20 ±1.4
p-value (t-test)	0.80	0.52	0.21	0.20

Conflict of interest:
Employee: Novo Nordisk A/S: F. Nielsen, L. Ynddal, C. Rosenquist, J. Drustrup and L. Bjerre Knudsen

P-1405

Glycaemic control improves in type 2 diabetes patients when switching from twice-daily exenatide to once-daily liraglutide

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Aims: In a 26-week randomised trial in patients with type 2 diabetes inadequately controlled on metformin and/or SU (LEAD 6), liraglutide was more effective than exenatide (both as add-on therapy) in improving HbA_{1c} and beta-cell function, with less hypoglycaemia. This 14-week extension compared the effect of switching from exenatide to liraglutide with continued liraglutide treatment.
Methods: All 389 patients completing LEAD 6 entered the extension phase (97% of these completed the extension). Patients switched from exenatide 10 µg BD to liraglutide 1.8 mg OD (following 0.6 mg OD for 1 week and 1.2 mg OD for 1 week), or continued liraglutide 1.8 mg OD.
Results: Patients switching from exenatide to liraglutide showed significant improvements in several indices of glycaemic control, HOMA-B, weight (BW) and SBP. These improvements were associated with low rates of minor hypoglycaemia and nausea. One major hypoglycaemic event was reported. No pancreatitis occurred.
Conclusion: Switching from exenatide to liraglutide is well tolerated and achieves additional improvements in glycaemic control and cardiovascular risk markers. Liraglutide treatment provides long-term glycaemic, weight and SBP control with low rates of hypoglycaemia and nausea.

	Liraglutide	Exenatide	P-value	Liraglutide to liraglutide	P-value	Exenatide to liraglutide	P-value
	Wk 0–26	Wk 0–26	Wk 26	Wk 26–40	Wk 26–40	Wk 26–40	Wk 26–40
	(n=233)	(n=231)		(n=200)		(n=186)	
Diabetes duration, yrs±SE	8.5±0.4	7.9±0.4.9	NA	8.3±0.4	NA	7.7±0.4	NA
Baseline weight, kg±SE	93.1±1.3	93.0±1.3	NA	91.1±1.4	NA	91.0±1.3	NA
Baseline HbA_{1c}, %±SE	8.2±0.1	8.1±0.1	NA	7.0±0.1	NA	7.2±0.1	NA
Delta HbA_{1c}, %±SE	-1.1±0.1	-0.8±0.1	***	-0.1±0.04	NS	-0.3±0.04	***
% with HbA_{1c}<7.0%	54#	43#	*	61†	NA	57†	NA
Delta FPG, mmol/L±SE	-1.6±0.2	-0.6±0.2	***	-0.2±0.1	NS	-0.9±0.2	***
Delta BW, kg±SE	-3.2±0.3	-2.9±0.3	NS	-0.4±0.2	*	-0.9±0.2	***
Delta HOMA-B, %±SE	32.1±6.8	2.7±6.8	***	-1.8±4.8	NS	14.5±4.4	**
Delta SBP, mmHg±SE	-2.5±1.2	-2.0±1.2	NS	-2.2±0.9	*	-3.8±0.8	***
Minor hypoglycaemia, events/pt/yr	1.9	2.6	*	0.7	NA	1.3	NA
% reporting nausea	25.5	28.0	NA	1.5	NA	3.2	NA

Wk 0-26=ITT, Wk 26-40=ITT in non-randomised extension. Wk 26-40 comparison=Baseline was Wk 26 (LOCF) value. NS, non-significant; NA, not applicable (statistical significance not determined); #data wk 26; †data wk 40. *p<0.05; **p=0.001; ***p<0.0001.

Conflict of interest:
Paid lecturing: J Buse, L Blonde Novo Nordisk
Advisory board: J Buse, J Rosenstock, E Montanya, WE Schmidt Novo Nordisk
Employee: CT Chang, X Yu Novo Nordisk
Commercially-sponsored research: J Buse, J Rosenstock, L Blonde Novo Nordisk

P-1406

A novel adaptive dose-finding study to develop LY2189265, a once-weekly GLP-1 analog

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Aims: LY2189265 (LY) is a once-weekly, glucagon-like peptide-1 (GLP-1) analog being developed for the treatment of type 2 diabetes (T2DM). LY has been shown to improve glycemic control in patients with T2DM, but potential cardiovascular effects might be dose-limiting. An adaptive dose-finding, seamless, Phase 2/3 trial was designed to improve selection of the "right" doses for further development. A Bayesian algorithm will use observed real time effects to adapt the treatment allocation of new patients to LY doses.

Methods: This is a double-blind, placebo-controlled, active comparator study. It is divided into 2 stages based on 2 randomization schemes: an adaptive scheme (Stage 1) and a fixed scheme (Stage 2). The goal of Stage 1 is to select 2 LY doses. Patients are assigned to placebo, active comparator, or 1 of 7 LY doses. A Bayesian adaptive randomization scheme assigns patients to the LY doses and adapts every 2 weeks based on accumulating data of prespecified efficacy and safety endpoints. These measures are transformed into a single metric, a clinical utility index (CUI), to assess relative benefit/risk for each dose over the LY range. New patients have a higher probability of being allocated to LY doses predicted to provide therapeutic benefit (greater CUI) while minimizing exposure to less effective doses (lesser CUI). When sufficient data have accumulated, LY dose selection occurs or the trial will terminate, based on prespecified decision rules. If dose selection occurs, Stage 2 begins. Patients assigned to the selected LY doses/comparator arms in Stage 1 continue seamlessly on their therapies. New patients are randomized to the selected LY doses/comparator arms using a fixed randomization scheme. Final analysis will be based on pooled data from the selected doses/comparator arms in Stage 1 and Stage 2.

Results: Simulation of this design using the most likely pharmacodynamic model illustrates how the Bayesian algorithm adapts treatment allocations to the 7 LY doses in Stage 1 (Table 1). Over time, more patients within this adaptive design will be allocated to doses meeting the prespecified criteria, enabling more information to be gathered on those doses and better data-driven decisions to be made.

Table 1: Randomization Probabilities - Stage 1

Time (months)	Placebo	d1	d2	d3	d4	d5	d6	d7	AC
2	11%	11%	11%	11%	11%	11%	11%	11%	11%
6	20%	7%	11%	9%	11%	9%	7%	7%	20%
9	20%	8%	11%	9%	11%	8%	6%	5%	20%

AC = active comparator; d = dose

Discussion: This adaptive approach is advantageous to patients. Because adaptations are based on both safety and efficacy endpoints, exposure to less beneficial doses is minimized and assignment to more beneficial doses is increased (i.e., ones that have a higher probability of technical success). This improves the quality of decision making to either select the "right" doses or to stop the trial, halting further patient exposure.

Conflict of interest:
Stock ownership: Mary Jane Geiger, Zachary Skrivanek, Brenda Gaydos, Jenny Chien, Angela Thompson, and James Anderson are full-time employees of and own stock or stock options for Eli Lilly and Co.
Employee: Mary Jane Geiger, Zachary Skrivanek, Brenda Gaydos, Jenny Chien, Angela Thompson, and James Anderson are full-time employees of and own stock or stock options for Eli Lilly and Co. Donald Berry and Scott Berry are consultants to Eli Lilly through contracts between Eli Lilly and Berry Consultants, LLC.
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Other substantive relationships: Donald Berry and Scott Berry are consultants to Eli Lilly through contracts between Eli Lilly and Berry Consultants, LLC.

P-1407

Effect of combined pioglitazone and exenatide therapy on plasma adiponectin and lipid metabolism in type 2 diabetes

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Aims: We examined the effects of combined pioglitazone (PPAR-gamma agonist) and exenatide (GLP-1 receptor agonist) therapy on plasma adiponectin and glucose and lipid metabolism in patients with type 2 diabetes (T2DM).

Methods: 18 T2DM patients on diet and/or metformin (>3 months) received additional treatment with either pioglitazone 45 mg/day for 6 months (n=8, Age= 52±2 y, BMI= 30.1±2.1, HbA_{1c} = 7.9±0.4%) or combined therapy (n=10, 51±3 y, BMI= 32.9±1.7, HbA_{1c} = 7.5±0.4%) with pioglitazone (45mg/d) and exenatide (10 ug s/c twice daily) for 6 months. All subjects met regularly with a dietician and were advised a weight-maintaining diet during the entire study.

Results: Pioglitazone reduced fasting plasma glucose by 17% ($P<0.05$), fasting plasma FFA by 17% ($p<0.05$) and HbA1c (delta=0.7, $p<0.05$), while plasma adiponectin increased by 68% ($p<0.02$). Total cholesterol, LDL cholesterol and HDL cholesterol did not change significantly. Fasting plasma triglyceride decreased by 21% ($p<0.05$) and body weight did not change significantly (delta=0.2 kg, p=NS). Combined pioglitazone and exenatide therapy was associated with a significantly greater increase in plasma adiponectin (delta=181%, $p<0.01$) and a significantly greater reduction in fasting plasma glucose (delta= 33%, $p<0.05$), HbA1c (delta=1.0, $p<0.05$), fasting plasma FFA (delta=41%, $p<0.01$), and fasting plasma triglyceride (delta=37%, $p<0.05$) versus pioglitazone therapy despite the lack of a significant change in body weight (delta=-0.4 kg, p=NS). Total cholesterol, LDL cholesterol and HDL cholesterol did not differ significantly following therapy between the two treatment groups.

Conclusion: In patients with type 2 diabetes, the addition of pioglitazone and exenatide combined therapy is associated with a greater reduction in fasting plasma FFA, triglyceride and glucose levels and a greater increase in plasma adiponectin levels as compared to the addition of pioglitazone alone. These results suggest that exenatide may directly increase plasma adiponectin, lower circulating FFA, and reduce plasma triglyceride levels in the absence of significant alterations in body weight. The molecular mechanism(s) responsible for the effects of exenatide on adiponectin and fat metabolism need to be studied.

Conflict of interest:
Commercially-sponsored research: The study was sponsored by a research grant from Amylin Pharmaceuticals and Eli Lilly to Dr. Mandeep Bajaj

P-1408

Safety and tolerability, pharmacokinetics and pharmacodynamics of albiglutide in Japanese subjects with type 2 diabetes: A comparison with an ethnically mixed population

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Aims: Albiglutide improved glycemic control in a Phase 2b (Ph2b) trial in an ethnically mixed population when dosed weekly or less frequently. Here, the safety, tolerability, pharmacokinetics (PK) and pharmacodynamics of albiglutide in Japanese patients with type 2 diabetes mellitus (T2DM) were assessed and retrospectively compared with the Ph2b population.

Methods: In this single-blind, randomized, placebo-controlled study, 40 subjects (mean age 54.5 years, BMI 24.5kg/m^2, HbA_{1c} range 6.3–10.3%) received abdominal, subcutaneous injections of 15mg or 30mg once-weekly; 50mg biweekly (every other week); 100mg monthly albiglutide; or placebo for 28 days, and were followed up 15 days later.

Results: Albiglutide significantly reduced FPG (all doses except 100mg monthly) and HbA_{1c} (all doses) vs placebo.

	Albiglutide dose			
	15mg weekly (n=8)	30mg weekly (n=8)	50mg biweekly (n=8)	100mg monthly (n=8)
Placebo-adjusted change from baseline (LS mean difference)				
FPG, mmol/L (day 29/43)	-1.91*/-1.43*	-1.98*/-1.16*	-1.74*/-1.18*	-0.73/-0.29
AUC_{0-4} glucose, mmol/L (day 29)	-2.86*	-3.58*	-2.51*	-1.44
HbA_{1c}, % (day 29/43)	-0.58*/-0.87*	-0.57*/-0.78*	-0.63*/-0.79*	-0.51*/-0.59*
*p<0.05 vs placebo				

Albiglutide had a plasma t, of 5.3 days, CL/F of 68.7mL/hr and V/F of 12.6L. For all dosing schedules of albiglutide, AUC and C_{max} were numerically higher in Japanese patients than predicted in the ethnically mixed population: $AUC_{(0-7)}$ for 15mg weekly and 30mg weekly albiglutide were 218 and 437µg.h/mL vs 159 and 318µg.h/mL, respectively; $AUC_{(0-14)}$ for 50mg biweekly albiglutide was 728 vs 531µg.h/mL, respectively; and $AUC_{(0-28)}$ for 100mg monthly albiglutide was 1456 vs 1060µg.h/mL, respectively. C_{max} in Japanese patients compared with the ethnically mixed population for 15mg weekly, 30mg weekly, 50mg biweekly, and 100mg monthly albiglutide were 1407, 2813, 2839, and 4441ng/mL vs 1070, 2130, 2280, and 3760ng/mL, respectively. Additionally, the change in FPG from baseline at Week 4 following albiglutide was greater in Japanese subjects vs the ethnically mixed population.

Albiglutide was well-tolerated; GI events were lowest in the 30mg weekly group and were comparable with placebo in all doses except 100mg monthly. The most common AEs in the 100mg monthly group were flatulence (n=3, 38%), vomiting (n=3, 38%) and nausea (n=2, 25%). No serious AEs were reported.

Conclusion: Weekly or biweekly albiglutide demonstrated a favorable safety and tolerability profile and significantly improved glycemia in Japanese subjects with T2DM. The therapeutic index for albiglutide may be wider in Japanese vs non-Japanese subjects in part due to differences in its PK.

Conflict of interest:
Stock ownership: H. Nakajima - GlaxoSmithKline H. Miyahara - GlaxoSmithKline T. Kurita - GlaxoSmithKline M. Bush - GlaxoSmithKline F. Yang - GlaxoSmithKline M. Stewart - GlaxoSmithKline
Advisory board: Y. Seino - Novo Nordisk, Sanofi-Aventis, GlaxoSmithKline, Taisjo, Novartis, Takeda, Banyu
Employee: H. Nakajima - GlaxoSmithKline T. Kurita - GlaxoSmithKline M. Bush - GlaxoSmithKline F. Yang - GlaxoSmithKline M. Stewart - GlaxoSmithKline

P-1409

The long-acting GLP-1-receptor agonist albiglutide for the treatment of type 2 diabetes: a time course analysis of gastrointestinal adverse events in patients receiving concomitant background metformin

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Aims: Gastrointestinal (GI) adverse events can limit long-term adherence to GLP-1-receptor agonist therapies. This subanalysis from a Phase 2 trial assessing the efficacy and safety of albiglutide in type 2 diabetes examined the time course of GI events associated with albiglutide in a subgroup of subjects previously treated with metformin in order to more directly compare treatment effects of albiglutide with the clinical reference treatment, exenatide.

Methods: In this randomized, multicenter, double-blind, parallel-group, Phase 2 study, 356 subjects (mean age 54, BMI 32.1kg/m^2) with type 2 diabetes inadequately controlled with diet/exercise or metformin received subcutaneous placebo, albiglutide [weekly (4, 15 or 30mg), every other week (biweekly; 15, 30 or 50mg) or monthly (50 or 100mg)] or non-blinded exenatide twice daily (per label) over 16 weeks. The metformin subgroup included 245 patients.

Results: In the metformin group, despite comparable efficacy with top albiglutide doses in each schedule, the proportion of subjects experiencing at least 1 episode of nausea or vomiting was: 18.2% in 30mg weekly; 47.8% in 50mg biweekly; and 56.5% in 100mg monthly, vs 29%, 54.3%, 55.9% for the respective doses in the entire sample. For placebo and exenatide, proportions were 11.8% and 45.7%, respectively. Of note, the percentage of metformin subjects receiving albiglutide having nausea or vomiting >7 days ranged from 0 to 14.3%, compared with 0 to 15.6% for the entire sample and 31.4% with exenatide. All nausea and vomiting for 30mg weekly albiglutide were mild. The majority of events with 50mg biweekly or 100mg monthly dosing were mild or moderate (>85%). Rates of mild and moderate nausea and vomiting with exenatide were 63.6% and 36.4%, respectively.

Nausea or vomiting correlated with albiglutide exposure and decreased over time. The incidence was lower with more frequent, smaller doses, with no nausea or vomiting reported after week 8 in the 30mg weekly group. Less frequent, higher albiglutide doses were associated with more nausea or vomiting than the 30mg weekly dose. Rates of nausea or vomiting with the 100mg monthly dose of albiglutide increased after each injection, but decreased greatly during the period between injections. Similarly, following uptitration from 5µg to 10µg, an increase in nausea or vomiting with exenatide was noted.

Conclusion: Among patients on metformin, treatment with 30mg weekly albiglutide resulted in favorable GI tolerability, with all events being mild in nature and transient. A numerically smaller proportion of patients on background metformin in the 30mg weekly or 50mg biweekly albiglutide groups experienced nausea or vomiting compared with the equivalent groups in the total patient population.

Conflict of interest:
Stock ownership: M. Stewart - GlaxoSmithKline M. Bush - GlaxoSmithKline F. Yang - GlaxoSmithKline
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P-1410

A time course analysis of glycemic improvements with albiglutide, a long-acting GLP-1-receptor agonist for the treatment of type 2 diabetes

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Aims: Variations in FPG in response to pharmacologic therapies may be related to their underlying pharmacokinetics. Albiglutide is a GLP-1-receptor agonist with the potential for weekly or less-frequent dosing ($t_{1/2}$ of ~5 days). A Phase 2 study was conducted to determine optimal dosing and scheduling of albiglutide. The present time course analysis was conducted to examine the relationship between dose, dose schedule, and measures of glycemic control.

Methods: A total of 356 subjects (mean age 54, BMI 32.1kg/m^2) with type 2 diabetes (mean duration 5 years) previously treated with diet and exercise or metformin (mean baseline HbA_{1c} 8%) participated in this randomized, multicenter, double-blind, parallel-group study. Patients received subcutaneous placebo, albiglutide [weekly (4, 15 or 30mg), every other week (biweekly; 15, 30 or 50mg) or monthly (50 or 100mg)], or exenatide twice daily (as per label for clinical reference only; non-blinded) over 16 weeks. FPG was assessed throughout the study so that its time course and relationship to HbA_{1c} could be evaluated.

Results: After 16 weeks of treatment, similar HbA_{1c} improvements were observed with the highest dose of each albiglutide regimen (-0.87, -0.79 and -0.87% for 30mg weekly, 50mg biweekly and 100mg monthly dosing, respectively, vs placebo -0.17%, p<0.005). Exenatide reduced HbA_{1c} by -0.54%. Improvements in FPG were seen as early as the first assessment (2 weeks) in all albiglutide groups. Although there were similar changes in HbA_{1c} in the highest doses of albiglutide within each dosing schedule, the 100mg monthly regimen resulted in marked fluctuations in FPG between each dose. FPG reductions remained the most consistent over time for 30mg weekly, followed by 50mg biweekly albiglutide, and PK/PD modelling showed a clear relationship between albiglutide exposure and FPG reduction.

Change From Baseline FPG (mmol/L)					
Week	Placebo	Exenatide	Albiglutide 30mg weekly	Albiglutide 50mg biweekly	Albiglutide 100mg monthly
Baseline	9.9	9.5	9.6	10.0	9.8
2	-0.2	-0.8	-1.4	-1.1	-1.6
4	-0.4	-1.1	-1.4	-1.4	-0.6
5	-0.4	-1.1	-1.5	-2.2	-2.1
7	-0.2	-1.3	-1.5	-1.9	-1.1
8	-0.4	-1.4	-1.6	-1.3	-1.3
9	-0.3	-1.5	-1.5	-1.7	-2.3
12	-0.3	-1.3	-1.9	-1.5	-1.5
15	-0.4	-1.3	-1.5	-1.7	-1.3
16	-0.1	-0.8	-1.4	-1.3	-1.2

Conclusion: Albiglutide (30mg weekly, 50mg biweekly, and 100mg monthly) resulted in comparable improvements in HbA_{1c} in patients with type 2 diabetes over 16 weeks. The 30mg weekly dose had the least FPG fluctuation, followed by the 50mg biweekly dose. The stability of the FPG profile over time appeared to be related to more consistent exposure to albiglutide in weekly/biweekly regimens compared with monthly administration, which may be of clinical relevance.

Conflict of interest:
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Commercially-sponsored research: J. Reusch - GlaxoSmithKline, Takeda, Merck, Mannkind
Other substantive relationships: J. Reusch - GlaxoSmithKline, Takeda, Amylin, Merck J. Rosenstock - Merck, Pfizer, Sanofi-Aventis, Novo Nordisk, Bristol-Myers Squibb, Eli Lilly, GlaxoSmithKline, Takeda, Novartis, AstraZeneca, Amylin, Johnson & Johnson, Daiichi Sankyo and Mannkind.

P-1411

NICE guidelines on use of exenatide

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Aim:
Exenatide, an incretin mimetic is a new class of medication which has been approved by NICE (national institute for health & clinical excellence) for use in Type2 diabetes in conjunction with oral hypoglycaemic agents. British national guidelines (NICE) recommend use of Exenatide if Body mass index (BMI) >35, there is inadequate glucose control (HbA1C>7.5%) with oral agents or specific psychological, physical or biochemical problems arising from weight gain. NICE also recommends that Exenatide should be continued only if there is a 1% reduction in HbA1C at 6 months and weight loss of at least 5% at 1 year.
Method: We did a retrospective audit of 60 patients who were on exenatide. The case notes were reviewed and their medications, BMI and HbA1C documented before and after starting on exenatide. The BMI and HbA1C were compared at each clinical appointment and the response documented.
Results: Total 60 patients were audited. Majority (80%) of them were started on exenatide due to BMI >35 & poor glycaemia control, however a fair number (20%) were started due to poor glycaemia control (HbA1C>7.5%) only. Of the total 53% were male and 47% female. The average age was between 50-70yrs with a mean age of 59.1yrs.37% of the patients were on metformin & insulin prior to starting exenatide.22% were on metformin & sulphonylurea and 10% were on insulin only. After the initial dose adjustments 63% remained on combination of insulin and exenatide. BMI and HbA1C improved in 67% & 65% of patients respectively, however in 30% & 18% they remained the same. Mean BMI prior to going on exenatide was 45.2 which dropped to 38.7.Mean HbA1C was 9.9% and 8.8% pre and post exenatide. The follow up period was 2-12 months.
Discussion: The incretin-based therapies represent a new potential goal-oriented treatment in type 2 diabetes. Exenatide lowers blood glucose through multiple mechanisms, including enhancement of glucose-dependent insulin secretion, suppression of excess glucagon secretion, reduction of food intake and slowing of gastric emptying (1). Exenatide has been tried with insulin and in some studies used as a monotherapy (2).

In our audit exenatide improved glycaemia control and BMI in majority of the patients. Adding exenatide to insulin did not produce any further side effects and these patients did not require additional monitoring. Although we did not note any cause for concern regarding its use in combination with insulin, our sample size was very small and further studies are needed to evaluate it. However patients should be carefully monitored if they are on combination of insulin & exenatide.With the obesity epidemic in the developed and developing world followed by an epidemic of type 2 diabetes, exenatide represents a new and beneficial addition to the medicines used in type 2 diabetes.

No conflict of interest

P-1412

Gliptins added to metformin plus gliclazide therapy improves glycemic control in patients with type 2 diabetes inadequately controlled: an observational study

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Objectives: We sought to evaluate the improvement in blood glucose control among type 2 diabetes patients inadequately controlled with gliclazide and metformin after addition of dipeptidyl peptidase-4 (DDP-4) inhibitor (gliptin).
Methods: Observational, cross-sectional, non-controlled study, including patients suffering from type 2 diabetes more than 10 years. They were taking gliclazide 90 mg/day in combination with metformin 1,7 g/day. Results: A total of 104 patients attending the outpatient clinics of Beneficencia Portuguesa Hospital and Faculty of Medicine ABC (Sao Paulo, Brazil) were investigated (46% male). The mean age of the patients was 62,34 ± 4,2 years and the mean disease duration was 14,2 ± 2,5 years. There was a significantly higher reduction of fasting plasma glucose (174,34 ± 12,4 to 118,17 ± 17,2, $p<0,05$) and HbA1c (7,97 ± 1,42 to 6,6 ± 0,42, $p<0,05$) after the triple oral therapy was initiated. Although there was a slight reduction in weight it was not statistically significant (BMI: 29,15 ± 4,13 to 28,12 ± 5,2). No adverse effects were observed.
Discussion: The studies indicate that the greater glycemic control appears to reflect an improvement in islet function when the DDP-4 inhibitor is used, mainly in initial phases of diabetes. However, our findings suggest a beneficial effect on glucose control when DDP-4 inhibitor was added to a previously reported combination and this triple oral therapy may be a good treatment option in diabetic patients who refuse insulin therapy.

No conflict of interest

P-1413

Comparative study between vildagliptin and sitagliptin associated with metformin and/or oral hypoglycemic agents and/or insulin in the control of type 2 diabetes

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Introduction: DPP-4 inhibitors vildagliptin and sitagliptin reduce blood glucose by their effect in protecting the bioactive forms of GLP-1 and GIP. Both enhance the actions of the incretins stimulating post prandial insulin secretion, reduce plasma glucagon levels and also lower fasting glucose levels.
Objective: Compare the effectiveness of two DPP-4 inhibitors (vildagliptin and sitagliptin) associated with metformin and/or hypoglycemic agents and/or insulin in diabetic patients.
Material and method: Sixty-three type 2 diabetics using metformin and/or hypoglycemic agents and/or insulin with irregular control of the disease were evaluated in a six-months prospective study. A twice-daily dose of Vildagliptin (100mg daily) or Sitagliptin (daily dose of 100 mg) was added. These patients were compared regarding age, sex, average time of illness, fasting blood glucose levels (FBG), postprandial glucose (PPG) and glycosylated hemoglobin (A1C). Comparison between the two DPP-4 Inhibitors was also made.
Results: 29 patients used sitagliptin (ST) and 34 vildagliptin (VD). Twenty-seven of them were women and 36 were men, with age average of 62 years. The groups were homogeneous in relation to the age, sex and average time of illness (ST: 7.1 years; VD: 7.7 years). Before the study, the average of FBG was 8.2±2.1mmol/L for sitagliptin and 9.6±3.8mmol/L for vildagliptin, with reduction to 7.9±1.9mmol/L and 8.0±2.7mmol/L, respectively (p=0.28). When

evaluated the average of PPG the values were of 8.0±2.7 mmol/L for sitagliptin and 10.7±5.3mmol/L for vildagliptin with reduction to 7.7±3.0mmol/L and 7.5±2.3mmol/L, respectively (p=0.68). Patients who had used VD had a higher initial PPG (10.7mmol/L). Before the use of medications the averages of the A1Cs were 8.0±1.3% for sitagliptin and 7.9 ±1.1% for vildagliptin, with reduction to 7.4 ±1.2% and 7.0±0.8%, respectively (p=0.28).
Conclusion: The use of both DPP-4 inhibitors associated with metformin and/or oral hypoglycemic agents and/or insulin was effective in reducing the HbA1c, fasting glucose and postprandial glucose levels. Although vildagliptin group presented with higher PPG, no difference was found when comparison between the two drugs was observed.

Conflict of interest:
Paid lecturing: Mirnaluci Gama Paulino Ribeiro-servico de Endocrinologia e Metabologia-Hospital Universitario Evangelico de Curitiba

P-1414

Exenatide: a novel therapeutic opportunity to change natural history of diabetes secondary failure, our experience

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In most subjects affected by type 2 diabetes mellitus, hyperglycemia results from a failure of ß-cell insulin secretion to compense insulin resistance in peripheral tissues. Results from the U.K.P.D.S suggest that ß-cell failure is a progressive defect even in optimized therapy with diet, metformin, sulfonylureas or insulin. Despite the use of traditional therapies, it is often impossible to achieve and maintain adequate glycemic control in patients with type 2 diabetes. Glucoregulatory peptides, such as incretins, are currently being introduced in therapy for type 2 diabetes. Exenatide is a 39–amino acid peptide incretin mimetic that exhibits glucoregulatory activities similar to the incretin hormone glucagon-like peptide 1 (GLP-1).
Aims: Our study evaluated the effect of exenatide, in a group of out patients, on improving glycemic control in type 2 diabetic subjects unable to achieve adequate glycemic control despite treatment with combined metformin-sulfonylurea therapy.
Methods: One hundred and two subjects (median age 62 range 31-81, 61 M - 41 F) all treated with metformin and/or sulfonylurea (glibenclamide, glimepiride, gliclazide) have been enrolled in three different diabetic centres to adopt exenatide 5 - 10 mcg bis in die.
Results: At baseline fasting plasma glucose concentration was 171 ± 43 mg/dL, BMI 34.3 + 7,5 kg/m^2, waist circumference 112 ± 14 cm, median HbA1c 8.5 %, range 7.5–11.0% (normal value < 6%).
Statistical analysis was performed with MedCalc version 8.2.02 for Windows, significance level P 0.05.
Significant reductions were observed between baseline and 4 months values: HbA1c P 0,0004, BMI
P 0,0001, waist circumference P 0,01, also in fasting plasma glucose concentrations but not significant.
The incidence of adverse events was low, the most frequent was mild or moderate nausea and gastrointestinal pain. Only 5 subjects were lost to follow up.
Conclusion: This study demonstrated that exenatide therapy improved glycemic control in type 2 diabetes patients and was associated with weight loss and a modest reduction in fasting plasma glucose. No important adverse event have been associated with exenatide treatment in our patient. This novel therapy may offer another potential treatment option when two-drug oral therapy fails to maintain adequate glycemic control but should be potentially more effective if adopted as a first step of therapy in type 2 diabetics.

No conflict of interest

P-1415

Knowledge, attitudes and practices of doctors in India towards DPP-IV inhibitor therapy

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Aim & objective: DPP-IV inhibitors have recently been introduced in the Indian market, and promise to bring about a paradigm shift in the understanding and management of diabetes. This abstract aims to report on the recently conducted surveys among doctors regarding the use of DPP-IV inhibitors.
Study Design & Methodology: A total 166 doctors were approached during the RSSDI conference at Hyderabad, and the Diabetes India International conference at Bangalore, in 2008 end, to fill up a pretested semi-structured questionnaire. Of these, 21 were graduates, 33 had a postgraduate diploma in diabetes, 75 were internists, 20 had postgraduate qualifications in both diabetes and internal medicine, and 5 were endocrinologists, while 12 possessed other qualifications. The respondents hailed from all parts of the country, but the majority (70%) were from South India.
Results: At the time of the survey, sitagliptin had been available for 6 months, while vildagliptin had just been launched. Total 70.8% were aware of the gliptins, and had prescribed the drug in their practice. 21.2% of respondents were unaware of this class of drugs, while the others had no response. Of the doctors who had used these drugs, 48.9% physicians had experience with sitagliptin, 16.4% had prescribed vildagliptin, and 5.7% had tried both. The commonest indication was in patients with type 2 diabetes mellitus with dual drug combination failure, followed by triple drug combination failure, monotherapy, combination with insulin, and patients with intolerance to conventional oral agents. Doctors who did not use the novel class of drugs mentioned lack of knowledge, relatively high cost, and non-availability as the reasons for this. None of the doctors was aware of the synergistic effect of metformin and vildagliptin as well as vildagliptin co-prescription with insulin reduced the incidence of hypoglycaemia. When asked about the future of the DPP-IV inhibitors, 97.6% doctors replied that there was a tremendous scope for these molecules, and their use would grow rapidly.
Conclusion: This work has highlighted the enthusiasm and positive attitude of doctors in India towards the gliptins, while pointing out a few lacunae in knowledge. The indications for prescription in the users, as well as the reasons for inability or unwillingness to prescribe the drugs in the non-users have been identified, which can be used to monitor changing trends as well.

No conflict of interest

Inflammation and diabetes

P-1416

Leptin to adiponectin ratio in patients with type 2 DM and non-alcoholic fatty liver disease

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Background and aims: Nonalcoholic fatty liver disease (NAFLD) is a major cause of liver-related morbidity with possible progression to cirrhosis. NAFLD is often presents in persons with insulin resistance and hyperinsulinemia. Insulin resistance states are characterized by elevated production of several adipocytokines (leptin, resistin, TNFa, IL-6, TGFß, PAI-1). Adiponectin is the only known adipocytokine which produces antiinflammatory and antiatherogenic effects.
The aims of our study was to evaluate the prevalence of NAFLD in patients with type 2 DM, to assess plasma leptin-to-adiponectin ratio and proinflammatory state in patients with type 2 DM with and without NAFLD.
Materials and methods: The study enrolled 124 subjects with type 2 DM. The diagnosis of NAFLD was based on detection of fatty liver by ultrasonography with or without chronically elevated aminotransferase levels (ALT>1.5 times the upper normal values for 6 months or more). All subjects had negative

hepatitis B and C viral markers, negative history of alcohol intake, absence of autoimmune hepatits, Celiac disease, no evidence of genetic, drug-induced or cholestatic liver disease.

Results: The prevalence of NAFLD in patients with type 2 DM was 37.09%. NAFLD with elevated aminotransferase levels was present in 22 patients (17.74%) while NAFLD with normal liver enzymes was present in 24 patients (19.35%). Plasma leptin-to-adiponectin ratio were significantly higher in patients with NAFLD with elevated aminotransferase levels than in those with normal liver enzymes and than in subjects without NAFLD. Plasma levels of TNF-a and IL-6 were also significantly higher in patients with NAFLD and elevated aminotransferase levels than in patients with NAFLD and normal liver enzymes and than in subjects without hepatic injury. HOMA-IR was higher in patients with high leptin-to-adiponectin ratio.

Table 1. Characteristics of patients with type 2 DM with and without NAFLD

Parameter	Without NAFLD	NAFLD with normal liver enzymes	NAFLD with elevated aminotransferase levels	ANOVA p
Number	78	24	22	-
Adiponectin (µg/mL)	9.1±1.2	6.8±0.8	5.9±0.6	<0.001
TNF-a (pg/mL)	7.2±1.3	8.7±1.5	9.2±1.9	<0.001
IL-6 (pg/mL)	4.0±0.5	4.9±0.7	6.1±0.9	<0.001
Leptin (ng/mL)	11.3±2.5	15.3±2.9	22.3±3.8	<0.001
HOMA-IR	2.4±0.3	3.2±0.8	3.8±0.9	<0.001
Leptin-to-adiponectin ratio	1.24±0.3	2.28±0.6	3.72±0.9	<0.001
Data are means ± SD.				

Conclusion: The prevalence of NAFLD is higher in patients with type 2 DM than in general population. Although insulin resistance is present in all patients with type 2 DM, those with NAFLD present higher insulin resistance than those without NAFLD. Plasma leptin-to-adiponectin ratio and proinflammatory adipocytokines are higher in patients with NAFLD than in those without liver injury, suggesting a possible contribution of these abnormalities in the pathogenesis of NAFLD.

No conflict of interest

P-1417

Cream intake induces socs-3 and tlr-4: relevance to pathogenesis of inflammation and insulin resistance

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We have previously shown that the intake of macronutrients induces oxidative and inflammatory stress. Since the suppressor of cytokine signaling (SOCS-3) and toll like receptors 2 and 4 (TLR-2 and TLR-4) are induced by inflammation and since they also lead to interference with insulin signal transduction, we have now investigated whether the intake of cream, which has previously been shown to induce oxidative stress, also leads to the induction of SOCS-3 and TLR-4 along with inflammatory stress. Ten fasting normal subjects were given 33g of cream or water to ingest in 2 separate visits, and blood samples were collected at 0, 1, 3 and 5h. Mononuclear cells (MNC) were prepared. Intranuclear NFkB binding (EMSA), SOCS-3 and TLR-4 mRNA and protein expression were measured by RT-PCR and western blots. There was a significant increase in NFkB binding by 57±18% at 3hr following cream intake. In addition, TNFa and IL-1b mRNA expression in MNC increased significantly following cream intake (by 51±10% and 182±34%, respectively) while there was no change in IL-6 expression. SOCS-3 and TLR-4 mRNA increased significantly by 119±22% and 43±16% (P<0.05), respectively, at 3hr following cream intake while there was no change in SOCS-1 and SOCS-7 or in TLR-2. Consistent with the changes at the mRNA level, cream intake induced a significant increase in SOCS-3 and TLR4 proteins in MNC by 39±16% at 3 hours and by 39±16% at 3 hours, respectively (P<0.05). Water intake caused no change in NFkB binding, SOCS-3 or TLRs expression. Thus, the intake of cream not only induces oxidative stress and inflammation but also induces at two proteins key in the pathogenesis of insulin resistance. Repeated intake of saturated fat potentially contributes not only to atherogenesis but also to insulin resistance.

Marker\Hours	1	3	5	P*	P#
NFKB DNA binding	140±16	157±18	141±12	0.026	0.036
TNFa mRNA	120±11	151±10	132±13	0.036	0.031
IL-1b mRNA	225±50	282±34	238±31	0.006	0.015
SOCS-3 mRNA	155±10	219±22	174±18	0.012	0.018
SOCS-3 protein	135±17	143±21	122±15	0.037	0.043
TLR-4 mRNA	127±14	143±16	142±14	0.036	0.04
TLR-4 protein	114±8	139±16	131±14	0.039	0.044

Table 1: Change from baseline (100%) in inflammatory mediators following the intake of Cream (300 Calorie) in 10 normal weight healthy subjects. P*= P value with RMANOVA for within the same treatment comparisons; P# = P value with 2-way RMANOVA compared to water.

No conflict of interest

P-1418

Expression of inflammatory markers in Saudi male patients with type 2 diabetes mellitus

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Aims: Type 2 Diabetes mellitus (T2DM) is a subclinical chronic inflammatory disorder resulting in huge morbidity and mortality in the Saudi male population. In view of the important role of cytokines on the metabolism of glucose, the present study has assessed the association of serum levels of inflammatory markers such as IL6, resistin, CRP, TNF and IGF with the pathogenesis of T2DM.

Methods: This study has recruited 225 Saudi male subjects, consisting of 81 clinically diagnosed T2DM cases and 144 normal healthy, age and sex matched controls. The Fasting blood samples were collected from the subjects and used for biochemical and immunological analysis.

Results: On analysis of results, we found that serum IL-6 and resistin levels were significantly altered in the T2DM cases when compared to the controls ($p < 0.02$, $p < 0.001$ respectively). However, both case and control subjects shown similar levels of cytokines such as CRP, TNFa, and IGF ($p > 0.05$). Step wise linear regression showed that resistin and CRP were positively correlated and can act as independent predictors for serum IL6 levels ($p<0.001$).

Conclusion: The data suggest an association of low serum levels of IL6 and resistin with T2DM cases in Saudi males and further confirms the role of IL6 and resistin in assessing them as risk markers to T2DM.

No conflict of interest

P-1419

Increased histidine decarboxylase activity in diabetic placenta correlates with bradykinin B1 receptor expression

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Aim: Histidine decarboxylase (HDC) is an enzyme that catalyzes the conversion of histidine to histamine. Previously, we showed increased levels of histamine in diabetic placental tissue. Increased levels of bradykinin, a potent vasodilatory peptide for most vessels, except for the placental, have also been reported in diabetes. Expression of bradykinin B1 receptor becomes evident in the course of inflammatory response, whereas the B2 receptor mediates most of the effects induced by kinins. Here we examined comparatively a correlation between placental HDC activity and bradykinin receptors B1 and B2 expression in diabetes class C (after White) versus normal pregnancy.

Methods: Fourteen diabetic placentas were compared with 14 gestationally matched placentas from normal pregnancies (group I and group II, respectively). Tissue activity of HDC was assayed in placental samples obtained in a standardized manner. A modified method, described previously by Endo was applied. Briefly, histamine-free enzyme solution containing HDC has been obtained after homogenization with phosphorylated cellulose and centrifugation. Then, newly formed histamine after incubation of the enzyme solution with histidine (1 mM) was separated by chromatography and quantified fluorometrically as an indicator of HDC activity. Expression of bradykinin B1 and B2 receptors was examined in immunostained paraffin 5 mm sections (n=84 for each group) by quantitative morphometry in analysed

areas matched in mean vascular density. In order to measure the density of placental microvessels, staining with hematoxylin/eosin and computerized morphometry were performed.
Results: Mean HDC activity in group I was significantly ($p < 0.05$) increased compared to controls (3.98 ±0.24 vs 2.87 ±0.16 nmol/h/g ±SEM). Mean expression of bradykinin B1 receptors in Group I was augmented and reached 140.9% of the value for Group II ($p<0.05$). The differences in mean expression of B2 receptors did not reach statistical significance.
Conclusion: Increased HDC activity may explain particular phenomena observed in diabetic placental tissue. HDC-dependent histamine elevation may change locally vascular properties by influence on bradykinin receptors expression. Proinflammatory reactions mediated via B1 should be expected rather than changed vasomotor reactivity related to B2. Angiogenic properties of histamine and kinins should also be considered.

No conflict of interest

P-1420

Fractalkine concentration and fractalkine receptor expression in the human placental compartments – diabetic vs. normal pregnancy

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Aim: The human placenta is a fetomaternal organ and consists of two functionally distinct compartments, the fetal part – developed from chorion frondosum, and the maternal part – from decidua basalis. The placenta contains paternal genes, which makes it a natural semi-allogenic allograft. Fractalkine (CX3CL1), the sole member of the CX3C chemokine family, has demonstrated an important role in inflammatory conditions, allograft rejection and angiogenesis. Most of these activities are mediated principally through fractalkine receptor (CX3CR1). Increased angiogenic and proinflammatory activities were reported in diabetes. In this study we investigated comparatively (diabetic vs. normal pregnancy) CX3CL1 concentration and CX3CR1 expression in the two placental compartments.
Methods: Twelve placentas obtained after pregnancies complicated by diabetes White class C were compared with twelve placentas obtained from gestationally matched normal controls (group I and II, respectively). Placental samples from fetal and maternal compartments have been taken in standardized manner. Fractalkine concentration in placental tissue homogenates was measured immunoenzymatically using Human CX3CL1 ELISA Development Kit (R&D Systems Inc.). In order to examine CX3CR1 expression, paraffin 5 um sections ($n = 72$ for each group) were immunostained with rabbit polyclonal anti-human CX3CR1 (Santa Cruz Biotechnology Inc.). Quantitative computerized morphometry was applied and CX3CR1 expression was analysed in areas matched in mean vascular density.
Results: Higher CX3CL1 levels were detected in the maternal compartments within the groups. Fractalkine concentration in group I was significantly ($p<0.05$) increased in both fetal and maternal compartments, compared to the controls (group II) and amounted (mean values ng/mL ±SEM) 7.24 ±0.46 and 9.33 ±0.57 versus 2.76 ±0.19 and 3.98 ±0.27, respectively. Mean CX3CR1 expression in the maternal compartment was significantly ($p<0.05$) decreased in group I, whereas differences in CX3CR1 expressions between the fetal compartments were not observed.
Conclusion: Advanced glycation end-products and cytokine activation in diabetes may induce fractalkine upregulation and lead to related placental abnormalities, including disturbed angiogenesis. Decreased expression of CX3CR1 in the maternal compartment of diabetic placenta seems to represent a compensatory mechanism against the increase in CX3CL1 concentration.

No conflict of interest

P-1421

Periodontal disease with serum C-reactive protein values in diabetics

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Aims: The purpose of this study was to evaluate C-reactive protein values in diabetic persons with periodontal disease.
Methods: We randomly selected 250 patients from the dental outpatient department of BIRDEM, a hospital for persons with diabetes. Each of the 250 patients completed a dental check-up that included a questionnaire survey and clinical examination of periodontal status, including gingival bleeding, and evaluation of gingival inflammation and oral mucosa, to determine the person's periodontal health and treatment needs. A blood sample was collected for C-reactive protein values.
Results: The C-reactive protein values of 61.2% in persons with diabetes are within the reference range (< 6 mg/L), and values of 38.8% in diabetic subjects are above the reference range (> 6 mg/L) for persons with periodontal disease. This relationship was found to be statistically significant ($p < 0.016$). Among the 250 participants, 82 males and 71 females were within the reference range (< 6 mg/L), and 33 males and 64 females were above the reference range (> 6 mg/L). Thus, females had higher C-reactive protein values, and this was also found to be statistically significant ($p < 0.0025$). This study showed that there is a significant relationship between C-reactive protein values and periodontal disease in persons with diabetes, where more females having higher values. Chronic infections and inflammatory responses from diseases such as periodontitis may be the reason behind the initiation and progression of atherosclerosis.
Conclusion: High C-reactive protein values with periodontal disease is a predictor of coronary heart disease. Regular dental examination and routine scaling is essential for diabetic patients. This study is of interest to prevent coronary heart disease in diabetic subjects with periodontal disease but more studies with larger group of patients require to confirm this diagnosis.

No conflict of interest

P-1422

Inflammatory markers and silent myocardial ischemia in type 2 diabetes

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Aims: To measure the strength of association between serum biomarkers of inflammation and silent myocardial ischemia in type 2 diabetes
Methods: The authors have started a screening program for silent myocardial ischemia in asymptomatic subjects with type 2 diabetes in Mexico. A family medical unit from the Mexican Institute of the Social Security has been selected and all diabetics with no symptoms of coronary heart disease have been invited to participate. A graded exercise test was performed according to the Bruce protocol, following the American College of Cardiology/American Heart Association guidelines. Horizontal or descending ST-segment depression of at least 0.1 mV measured 80 ms after de J-point in 3 consecutive cycles was considered a significant sign of ischemia.To date 152 subjects with silent myocardial ischemia have been identified. In a case-control design they were compared with 371 controls. Controls were randomly selected from the same source population. Fasting venous blood was tested for glucose, total, high and low-density lipoprotein cholesterol, triglycerides, glycosylated hemoglobin and inflammatory markers: intercellular adhesion molecule-1 (I-CAM), vascular cell adhesion molecule-1 (V-CAM), E-selectin, resistin, interferon-gamma, interleukin-6 (IL-6), interleukin-10 (IL-10) and high sensitivity C reactive protein. Mann-Whitney U was used to compare median values between groups and odds ratio (OR) with 95% confidence intervals (95% CI) were estimated while classifying inflammatory markers into tertiles. A logistic regression model was employed to control for potential confounders.
Results: Median values of I-CAM, V-CAM, E-selectin, resistin, interferon-γ and IL-6 were significantly higher in cases. In the logistic regression model, adjusting by age, sex and duration of diabetes, an increased risk was observed

in the highest serum values tertile of V-CAM (OR 11.31; 95%CI 5.6–22.9) E-selectin (OR 2.90; 95%CI 1.5–5.4), IL-6 (OR 8.11; 95%CI 3.6–18.4) and resistin (OR 1.85; 95%CI 1.0–3.5). A dose–response effect was observed with these inflammatory markers. No relation was observed between silent myocardial ischemia and metabolic control parameters.

Discussion: Inflammation plays a major role in atherosclerosis and coronary heart disease, particularly in the context of diabetes. The appreciation of the role of inflammation in silent myocardial ischemia in diabetes, provides insights into its pathogenesis, and offers opportunities for diagnosis and prediction of this subclinical and early manifestation of coronary artery disease, a major complication in type 2 diabetes.

No conflict of interest

P-1423

Valuation of the thyroid gland function in type 2 diabetes mellitus patients

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The prevalence of thyroid diseases in diabetics is over 2-3 times than individuals whithout diabetes. In type 2 diabetics we can find 3 to 6% of primary hypothyroidism and 0,3% of hyperthyroidism. The metabolic disturbancess that are observed in type 2 diabetics (DM2) can modify the values of serum TSH, freeT4 and freeT3. The thyroid dysfunctions can change glycemic control, insulin resistance, cholesterol levels and thyroid gland function. Elevated values of serum TSH are associated with elevated concentrations of cholesterol and triglycerides. The hypothyroidism reduces the activity of the cardiovascular system and has atherogenic effects, increasing the macroangiopathic complications in diabetics. The hyperthyroidism (subclinical too), increases the risk of atrial fibrillation to stimulate the cardiac function. This is a observational, retrospective study to evaluate the thyroid gland function in type 2 diabetics, through the analyses of handbooks of patients in the Endocrinology Clinic of the Beneficence Portuguese Hospital in Sao Paulo-Brazil, between June and December, 2006. 169 handbooks of type 2 diabetics with at least one evaluation of thyroid function were selected. The data was obtained through a protocol with sex, age, blood pressure levels, disease duration of DM2, BMI, metabolic syndrome (MS) like criteria of National Cholesterol Education Program (NCEP), family history of thyroid disease or DM2, HbA1c levels, serum glucose levels, serum lipid levels, TSH, free T4, TPOAb, TGAb and TSAb.As well as this, the different treatments for diabetes were inclueded too. Serum TSH levels (2 bands: 0,5 to 2,99µU/mL and 3 to 5,5µU/mL) and thyroid status (TSH and free T4) were crossed with time diagnoses, BMI, MS, family history of thyroid disease and DM2, HbA1c, serum glucose levels and sex, which were analyzed by Pearson correlation. Analysing the clinical and laboratory characteristics, we could observe large prevalence of women in the cohort (55,6%). The age, on average, from the 169 patientes were 61,6 ±11 years; the serum glucose values were 160,7 ±69,7 mg/dL and TSH levels were 3,1±3,9 µU/mL; 39,6% of the patients have BMI between 25 – 29,9 Kg/m^2; 68,3 % were included in the criterias of MS. About family history, 49,1% had positive comorbities with DM2 and 8,3% with thyroid diseases. Results show a weak positive correlation between TSH and BMI: r = 0,07, between TSH and serum glucose = r 0,01; between thyroid status and time of DM2 r=0,15, BMI r=0,09, HbA1c r=0,06 and glucose values r=0,009.The thyroid diseases have correlation with metabolic disturbances, in this study, we could find correlation between serum TSH levels and glucose levels as well as HbA1c levels. So, the most important from this study is that we have to investigate thyroid diseases in all type 2 diabetics.

No conflict of interest

P-1424

Increased plasma C-reactive peptide (CRP) in type 2 diabetes (T2DM) with metabolic syndrome

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Aim: CRP are usually increased in diabetic patients. But the reason is still not clear.

Subjects and methods: We examined the serum CRP in 418 T2DM when they come to screen their diabetic complications in our diabetic center during July 2003 to Sep. 2008. Their body mass index (BMI), waist/hip (W/H), systolic and diastolic blood pressure (sBP and dBP), fasting and postprandial glucose and insulin levels, HbA1c, plasma lipid, creatinine and urine albumin/serum creatinine (Alb/Cr) were measured in the same time, and compared by normal CRP (NCRP: CRP≤3mg/l) and high CRP (HCRP:CRP>3mg/l).

Results:

1. Only 93 T2DM (22.2%) were HCRP with 5.46±2.07mg/l CRP levels, and 325 T2DM were NCRP with 0.99±0.77mg/l CRP levels.
2. Significant increased BMI (HCRP 26.80±3.75 vs NCRP 25.66±3.59 Kg/m^2, p=0.008), W/H (HCRP 0.94±0.06 vs NCRP 0.92±0.06, p=0.024), sBP (HCRP 139.36±25.27 vs NCRP 132.35±21.02 mmHg, p=0.007), dBP (HCRP 79.38±10.56 vs NCRP 76.68±9.25 mmHg, p=0.017), HbA1c (HCRP 8.36±1.92 vs NCRP 7.84±1.77%, p=0.015) and TG (HCRP 3.02±4,45 vs NCRP 1.90±1.38 mmol/l, p=0.000), but lower height (HCRP 1.62±0.09 vs NCRP 1.62±0.08 m, p=0.033) HDL-C (HCRP 1.38±0.27 vs NCRP 1.46±0.34 mmol/l, p=0.033)were found in HCRP. However CRP levels were not significantly different between the young and the elder T2DM.
3. Correlations were found positively between CRP with age at both screening and diagnosed of diabetes, BMI, W/H, dBP, dBP, HR, postprandial glucose, fasting insulin levels, TG and Alb/Cr, and negatively with height and TG, but not with duration of diabetes.

Conclusions: Increased CRP levels were found in 22.2% T2DM in our study. The HCRP T2DM seems like having metabolic syndrome characters. Whether the aging was the risk factor of higher CRP was not understood.

No conflict of interest

Insulin therapy and devices

P-1425

Patient treatment satisfaction after switching to biphasic insulin aspart 30 in the IMPROVE™ study

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Aims: Treatment satisfaction (TS) is a key patient-reported outcome that may differ between treatments and impacts patient adherence, treatment costs and self-management behaviors. The effect of switching to biphasic insulin aspart 30 (BIAsp 30, NovoMix® 30) and likely confounding factors on TS was examined using data from the IMPROVE study, a multinational, 26-week, open labeled, observational study of the safety and effectiveness of BIAsp 30 for the treatment of type 2 diabetes in routine practice.

Methods: Data from 52,419 patients were available, and 18,823 patients (previously on oral agents or on basal or biphasic human insulin) with both baseline and end of study TS observations were included in the analysis. TS was assessed with the validated DiabMedSat questionnaire which examines efficacy, relief of burden, relief of symptoms and overall TS. Independent ANOVAs were performed to examine the influence on TS of pre-treatment factors (age, gender, country, duration of diabetes, prior treatment, diabetes-related comorbidities) and current treatment factors (reaching HbA_{1c} goal, weight gain, hypoglycemic events).

Results: Patients previously on oral therapy had a mean baseline HbA_{1c} of 9.2% and mean time since diagnosis of 7.4 years; after 26 weeks of BIAsp 30 therapy mean HbA_{1c} dropped to 7.1% ($p<0.01$) and all TS domains improved ($p<0.001$). Patients previously on insulin had a mean baseline HbA_{1c} of 9.3% and a mean time since diagnosis of 10.4 years; after 26 weeks mean HbA_{1c} dropped to 7.3% ($p<0.01$) and all TS domains improved ($p<0.001$). Although the magnitude of improvement differed by country, patients in all countries had significantly improved TS. Examination of the effect of pre-treatment factors found that higher age was associated with greater levels of satisfaction for overall TS ($p<0.001$), efficacy ($p<0.01$) and relief of burden ($p<0.001$). Patients with a longer duration of diabetes reported greater burden relief ($p<0.01$), and those with diabetes-related comorbidities had greater TS for relief of symptoms ($p<0.001$) and burden ($p<0.05$). Analysis of the impact of side effects and reaching HbA_{1c} goal found that weight gain and minor hypoglycemic events were associated with lower TS in all domains ($p<0.001$), and of patients who reached their HbA_{1c} goal, 98% also reported relief of burden ($p<0.05$) and symptoms ($p<0.01$).

Discussion: This analysis shows that BIAsp 30 significantly improved TS, even in patients previously on oral agents, suggesting that improved management of HbA_{1c} with insulin compared with oral therapy may alleviate the perceived treatment burden of daily insulin use. In addition, treatment side effects should

be considered when choosing the preferred insulin as these events significantly impact patient TS.

Conflict of interest:
Advisory board: M Brod, Novo Nordisk
Employee: T Christensen, Novo Nordisk A/S

P-1426

Positive impact of biphasic insulin aspart 30/70 (BIAsp 30) on physician resources: insights from the IMPROVE (TM) study

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Aims: Regimens that are straightforward to teach and easy for patients to learn offer benefits to physicians, especially where time and resources are limited; this analysis aims to quantify the impact on physician resources of initiating insulin with, or switching patients onto, biphasic insulin aspart 30/70 (BIAsp 30).
Methods: IMPROVE™ is an international, open-label, 26-week observational study designed to evaluate the safety and effectiveness of use of BIAsp30 in everyday clinical care. Patients with type 2 diabetes on a variety of regimens (n=52,419) were recruited and prescribed BIAsp 30 at the discretion of their physician, and in accordance with local practice. In addition to recording standard clinical endpoints, physicians were also given a series of resource utilisation questions, designed to explore their perceptions and time investment when starting patients on BIAsp30 using cartridges or a prefilled pen. This abstract reports data comprising physicians' evaluation for each patient initiated onto BIAsp 30.
Results: The majority of physicians (>80%) found it easy or very easy to introduce BIAsp 30 into their patients' regimen, with most (88%) being satisfied or very satisfied that BIAsp30 enabled them to achieve their preferred HbA_{1c} target. Most physicians were confident or very confident that patients would continue to maintain good glycaemic control, including post-prandial blood glucose control (89% and 90% respectively). The majority of physicians (97%) stated that they would continue to treat patients in the study with BIAsp30 following its conclusion and overall most (96%) preferred or strongly preferred BIAsp 30 to other insulins. When insulin-naïve patients were considered as a separate subgroup (n=42,368), nurses, physicians and other healthcare practitioners were still able to teach patients to self-inject BIAsp 30 in 10 minutes or less (70%, 80% and 65% respectively), with most able to do so in under 5 minutes. Following this introduction, most physicians (87%) were confident that patients initiated onto insulin with BIAsp30 were able to self-inject correctly.
Conclusion: BIAsp 30 can be easily introduced into a regimen: explanations could be made simply, and the majority of physicians were confident that their patients were able to follow their prescribed treatment and maintain good glycaemic control. Most patients were initiated onto insulin without the need for formal referral to a diabetes education clinic, thus saving time and expense. These data suggest that BIAsp30 use may support the management of insulin therapy where time and resources are limited, as in primary care practice.

Conflict of interest:
Paid lecturing: JG Gumprecht, speaker's honoraria from Novo Nordisk
Employee: VK Knudsen, employee Novo Nordisk

P-1427

Acute onset diabetic ketosis in Japanese: clinical course and prognosis

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Background & aim: Ketosis-prone diabetes (KPD) is a widespread, emerging, heterogeneous syndrome characterized by patients who present with diabetic ketoacidosis or unprovoked ketosis. On the other hand, similar ketosis-onset diabetes, "soft drink ketosis" has been widely recognized in Japan, which refers to a syndrome of acute onset ketosis induced by large consumption of soft drink in subjects with type 2 diabetes mellitus. A striking aspect of these entities is that substantial proportion of patients can successfully discontinue insulin therapy. So far, few studies have analyzed clinical course of these ketosis-onset diabetic patients and predicting factors of successful insulin discontinuation. In the present study, we investigated the clinical characteristics of Japanese patients with newly diagnosed, acute onset diabetic ketosis or ketoacidosis and retrospectively analyzed predicting factors of future insulin discontinuation.
Subjects & methods: The study included consecutive 1296 in-patients, who were admitted to our center during April 2003 to October 2008. Ketosis-onset diabetes was defined as newly diagnosed diabetes mellitus, presenting with ketosis or ketoacidosis. Several factors were compared between the patients with ketosis-onset diabetes who successfully discontinued insulin therapy within six months of diagnosis (group A) and those who continued insulin therapy after six months (group B), including age of onset, body mass index (BMI), HbA1C level, anti-glutamate decarboxylase (GAD) antibody titers, and insulin secretion indices at diagnosis.
Results: In consecutive 1296 in-patients, a total of 25 subjects (16 males, 9 females) were included, who met the inclusion diagnosis of ketosis-onset diabetes. They were divided into group A (n=7), and group B (n=18). There were significant differences between group A and B in sex (male predominance in group A), BMI (group A: 27.7±4.23 vs group B 20.2±5.45 kg/m2, p=0.01), 24-hr urine C-peptide (59.0±32.4 vs 25.7±25.8 μg/day, p=0.03), and fasting plasma C-peptide (1.09±0.42 vs 0.62±0.61 ng/ml, p=0.05) at diagnosis. The rate for positive anti-GAD antibody was not significantly different between the two groups (16.7% vs 44.4% p=0.15). Characteristics of patients without anti-GAD antibodies were similar to those of soft drink ketosis, ie large consumption of soft drink, and mainly male obese subjects.
Conclusions: These results suggest that a significant proportion of Japanese patients with ketosis-onset diabetes subsequently achieve successful insulin discontinuation. Patients with higher BMI, 24-hr urine C-peptide, fasting plasma C-peptide at diagnosis are more likely to discontinue insulin therapy. Clinical characteristics of these patients are similar to those of so-called "soft drink ketosis," suggesting that there is considerable overlap between KPD and "soft drink ketosis."

No conflict of interest

P-1428

Insulin VIAject™ but not insulin lispro or regular human insulin can normalize vascular function and endothelial insulin action in patients with type 2 diabetes mellitus

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Background: Postprandial (pp) insulin delivery has a major impact on pp oxidative stress and endothelial function. This study compared the effect of the ultra-rapid prandial insulin VIAject™ (VJ) with human regular insulin (HI) and insulin lispro (LP) on markers of oxidative stress, endothelial function and post-receptor insulin function in patients with type 2 diabetes mellitus.
Material and methods: Fourteen patients with type 2 diabetes (7 male, 7 female; age 61.5±1.8 years; disease 6.6±4.6 years; HbA1c 7.2±0.5 %; mean±SEM) received a single prandial injection of VJ, HI, and LP in a randomized, cross-over study. At baseline and 10, 20, 30, 60, 120, and 180 minutes after a standardized liquid meal test, the pp increase in asymmetric dimethylarginine (ADMA) levels, nitrotyrosine, microvascular blood flow, skin oxygenation, vascular elasticity and eNOS/MAPK-expression in peripheral monocytes were investigated.
Results: Equal pp glucose control was achieved in all treatment arms. Treatment with VJ showed reduced ADMA generation (VJ: -2.73±2.26; HI: 9.77±2.44; LP: 6.69±3.39 nmol/L; p<0.05 respectively), decreased nitrotyrosine levels (VJ: -0.22±0.17, HI: 0.25±0.15 μg/ml; p<0.05; LP: 0.09±0.07 μg/ml; n.s. vs. VJ). This was associated with improved microvascular blood flow (VJ: 7.1±5.7; LP: 1.9±7.6; HI: 1.2±3.1 AU; p<0.05 respectively) and skin oxygenation (VJ: 2.7±2.4; LP-2.5±1.9; HI-1.9±1.6 %; p<0.05 respectively), and similar central arterial elasticity.
Treatment with HI increased expression of MAPK-1 (60 min +0.4±0.8 AU), and decreased eNOS expression (60 min: -0.4±1.1 AU). In contrast, VJ resulted in opposite results (MAPK-1: -0.2±0.4 AU, p = 0.11, eNOS: +0.4±0.8 AU, p<0.05). The results with LP were between these extremes, but still significantly different as compared to VJ. In this pilot study, treatment with the ultra-fast

regular human insulin formulation VJ resulted in reduced oxidative stress and molecular indications of an improved endothelial function than treatment with LP or HI. These results suggest that the pharmacokinetic profile of insulin may have a major impact on the vascular effects of insulin in patients with type 2 diabetes mellitus, which is independent from glycemic control.

Conflict of interest:
Paid lecturing: Biodel: T. Forst, A. Pfützner
Advisory board: Biodel: T. Forst, A. Pfützner
Employee: Biodel: F. Flacke, P. Pichotta, A. Krasner, S. Steiner
Commercially-sponsored research: Biodel: T. Forst, A. Pfützner

P-1429

Insulin glargine based therapy in type 2 diabetes: From pathophysiology towards achieving glycaemic targets in real life with proper knowledge

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Aims: The most recent analysis of the UKPDS have shown that insulin therapy reduces the risk of both micro and macrovascular disease in type 2 diabetes. Given the large number of type 2 diabetic patients that are poorly controlled and the shortage of proper knowledge to initiate insulin therapy with most required insulin regimen, there is a need to develop simple and safe insulin treatment regimens, which focus on empowering the patients with proper knowledge for self management skills. A key component in empowering patients to manage their own diabetes for good glycaemic control is education. The aim of this study was to assess the relationship between glycaemic control with insulin glargine and patient education among Bangladeshi type 2 diabetic subjects.
Methods: A total number of 86 subjects (M 49%, F 51%) were selected purposively from among the patients attending diabetes counseling center (age, 62±12.9 yrs, mean ±SD). Data were collected by a predesigned questionnaire and by examining the patient record books.
Results: The mean (±SD) value of fasting blood sugar (FBS), random blood sugar (RBS) and HbA1c of the study subjects (who received premix based regimen) were 14.9±4.4 mmol/L and 17.2±5.1 mmol/L and 9.5±0.7% respectively. On the other hand, the mean (±SD) value of fasting blood sugar (FBS), random blood sugar (RBS) and HbA1c of the same study subjects (now who receive insulin glargine based regimen) were 7.3±1.5 mmol/L and 9.2±2.3 mmol/L and 7.3±0.6% respectively. Over a 4.6 year period, fasting blood glucose (FBS), random blood glucose (RBS) and HbA1c target (< or = 7%) was significantly better (p=0.05) in the group treated with insulin glargine based regimen than the group receiving premix based regimen. Although 84% subjects knew the ideal level of HbA1c, but only 11% said that diabetes mellitus is not a disease. About 16% believed that proper diet, exercise and medicines affect glycemic control excellent. Almost half of the subjects (45%) knew that skipping meals is the cause of low blood glucose. A significant negative correlation was found between fasting blood sugar and total knowledge score of the subjects (r=-0.45, p=0.0001).
Conclusion: Glycaemic targets can be reached with more physiological/ simple regimens in combination with proper knowledge. And that can only lead to an improvement in diabetes control more strongly. More attention should be paid to such strategies in day to day practice.

No conflict of interest

P-1430

Intravenous insulin for 24 hours in patients with diabetes mellitus submitted to percutaneous coronary intervention with stent: effects on oxidative stress and inflammatory markers

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Intravenous insulin infusion is a strategy to maintain tight glycemic control in critical care and coronary unit patients, although it was not evaluated in diabetic patients after coronary angioplasty (PCI), a situation where its antiinflammatory and antioxidant effects could be beneficial.
Aim: To evaluate the effects of intravenous insulin/24h to normalize glycemia on markers of oxidative stress (protein oxidation and total antioxidant defense) and inflammation (CRP and sCD40L) in diabetic patients submitted to PCI with stent.
Methods: Prospective, open label randomized controlled trial, comparing continuous intravenous insulin/24h guided by glycemia (Optium, Abbott), evaluated hourly, targeting values <110 mg/dl (IIT, n=35) to conventional treatment (CT, n=35, glycemia before meals and subcutaneous regular insulin if values >200 mg/dl) in diabetic patients submitted to PCI. Blood samples for glycemia, HbA1c, lipids, inflammatory markers (CRP and sCD40L) and oxidative stress (total antioxidant status - TAS, carbonyl) were collected immediately after the PCI and at the end of insulin infusion. Results were analyzed with ANOVA, Mann Whitney and Student t test.
Results: Patients were 60.5 ± 10 years old, 60% were men, HbA1c 8.1 ± 1.8 (IIT) vs 7.6 ± 1.6% (CT) (p=0.394). Continuous intravenous insulin for 24h determined lower glycemia in the IIT group (160 ± 63 vs 199 ± 98 mg/dL, p=0.006) and higher insulinemia (171 [59-550] vs 25 [11-50] mu/l, p< 0.001). However, no significant change was observed in protein oxidation (carbonyl 0.13 ± 0.12 (IIT) vs 0.12 ± 0.94 nmol/mg (CT), p= 0.70), total antioxidant defense (TAS 1.66 ± 0.23 (IIT) vs 1.63 ± 0.22 mmol/L (CT), p= 0.33), CRP [4.5 (2.1-11.7) vs 6.8 (2.4-10.3) mg/L, p= 0.35] and sCD40L [402 (191-843) vs 610 (230-1200) pg/mL, p= 0.68]. CRP levels increased after PCI in both studied groups (p<0.001). There was a positive correlation between final CRP and glycemia (r = 0.340, p=0.010).
Conclusions: Although continuous intravenous insulin for 24h effectively increased insulin levels and prevented further hyperglycemia episodes, a clear rise in inflammatory markers was observed after PCI in both groups. No effect of treatment was observed on oxidative stress and inflammatory markers.

No conflict of interest

P-1431

Stem cell therapy in type 1 diabetes

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Aims: Cell therapy has been considered as one of the most promising superlative potential treatment for type 1 diabetes. In this regard stem cell transplantation (SCT) has been carried out by implantation of live tissue fragments of different organs and tissues, of human (allo-, or auto-) or animal (xeno-) origin, from fetal, neonatal, juvenile, or adult stage as an effective tool in repair of recipient organ tissues.
The aim of this study was to examine the outcome of treatment with fetal stem cells in patients with type 1 diabetes under specific conditions.
Methods: Thirteen type 1 diabetic patients with age between 6-30y, duration of disease up to 1 year, blood glucose less than 15mmol/l and without any refractory complication were selected. Hematopoietic stem cells from human

fetus (6w-12w of pregnancy) were obtained and checked for viral infection including HCV; HBV; HIV and uro-genital infection. Cells maintained by cryopreservation and were injected intravenously within 20-30 min in each patient. Blood glucose monitoring was performed every hour within first 24 hours post cell therapy in all patients. Primary clinical and laboratory data was collected in the day of hospitalization.

Results: Blood glucose levels gradually decreased within 24 hours after treatment in 11 patients. Insulin independence occurred in 4 patients whose insulin requirement was 22-42 unit/day before treatment 24h after cell therapy. Significant decrease in insulin dosage occurred in 8 patients during a 6-month follow-up period (Their insulin requirement was 11-36 unit/day before treatment).

Conclusion: It seems that stem cell therapy in type 1 diabetics could improve hyperglycemic status. Stem cells under injured environments can promote the secretion of a variety of cytokines and growth factors that have both paracrine and autocrine activities. The paracrine function of transplanted cells rather than cell Transdifferentiation may play a crucial role in the hyperglycemic reversal immediately after treatment in our diabetic patients. Further studies with greater sample size and longer follow-up duration are warranted to further evaluate the outcome of cell therapy in patients with type 1 diabetes.

No conflict of interest

P-1432

Insulin glargine reduces blood glucose level with less hypoglycaemic events

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Aim: Our aim was to present the effects of insulin glargine on glycaemic control and frequency of hypoglycaemia.

Methods: 35 type 2 diabetic patients (17 male and 18 female) with poor glycaemic control were included in this trail. The study lasted for 6 months. The patients were treated with twice daily premix human insulin + metformin 850 mg after each meal. We switched patients onto once daily insulin glargine + metformin 850 mg after each meal, and followed FBG, PPG, HbA1c and frequency of hypoglycemia. Doses of insulin were titrated separately for each patient (0,7- 1IU/kg). The mean age of patients was 55.09± 5,56 years. The mean diabetes duration was 4,77 ± 1,61. The mean BMI prior the study was 31,70 ±5,45kg/m^2, and at the end of the study it was 30,18 ± 4,90 kg/m^2 p <0,05. The mean number of insulin units on the beginning of the study, with premix human insulin therapy was 56,54 ± 17,22 IU/day, while on the end of the study with glargine therapy was 43,43 ± 13,71 IU/day.

Results: The mean FBG prior the study was 13,50 ± 3,93 mmol/L, after 6 months mean FBG was 7,27 ±1,26mmol/l p <0,05. The mean HbA1c prior the study was 9,33±1,29%, after 6 months mean HbA1c was 6,87 ± 1,34%, p <0,05. Prior the study, frequency of hypoglycaemia was higher 0,82 ±0,77 than after the study 0,2 ±0,4, p< 0,002. Nocturnal hypoglycaemia frequency was 0,77± 0,75 prior the study and after the study 0,08 ± 0,27, p <0,005.

Conclusion: After six months of treatment with basal insulin glargine, significant improvement of FBG and PPG were achieved with significantly lower HbA1c level, with reduced total daily insulin doses and reduced frequency of hypoglycemia. Treatment with insulin glargine improves glycaemic control with lower frequency of hypoglycaemia, compared to treatment with twice daily premix human insulin.

No conflict of interest

P-1433

Tight blood glucose control in T1DM via continuously-adjusted insulin delivery based on frequent blood glucose sampling

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Aims: Classical T1DM therapy includes three or more blood glucose concentration measurements daily and a similar number of insulin injections. Nevertheless the most important factor for treatment success is the patients' nutritional habits and their acceptance of and adherence to the treatment. Even in the best of cases hypoglycemia episodes can occur. An automatic insulin pump improves therapy results, but a risk of hypoglycemia still exists.

Method: This research is focused on closed-loop insulin pump therapy for T1DM. It includes on line blood glucose (BG) information from a glucose sensor. The approach is to design a mathematical algorithm able to determine the short term insulin requirement using High Order Sliding Mode control. This technique does not require as input any of the patient parameters, such as insulin resistance or glucose effectiveness. It means that is possible to design a universal insulin delivery controller that is suitable for every patient.

Results: A preliminary test of the controller, was conducted with three different mathematical models to generate in silico patients (SP); the Bergman Minimal Model, the Hovorka Model, and the Sorensen Model. For each model three different SP are simulated with insulin resistance 5.5±5 min^{-1}per mU/l. This study simulations lasted 400 minutes, with initial conditions for BG of 130mg/dl. At minute 100, meal ingestion is simulated, and postprandial BG is 180±25 mg/dl. BG for every patient is under 110mg/dl at minute 300, after minute 350 all SP reach the BG target of 90mg/dl.

Discussion/conclusion: This type of designed controller can be used for any patient, due to the fact that it is not designed for any specific parameter set or mathematical model. The success of this therapy depends on an accurate BG sensor and the only input to the controller is BG level which reduces the risk of hypoglycemia. The sensors available are able to measure BG every 10 seconds. In the simulations, pump dynamics and sensor sample rate are considered in order to have an implementable system for a trial in a clinical setting.

No conflict of interest

P-1434

Expectations and experiences with insulin therapy in the prandial-basal insulin regimens to improve mealtime glycemia in type 2 diabetes study

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Aims: Knowledge of patients (pts)' expectations and experiences with insulin therapy may help inform clinical practices on insulin initiation and intensification.

Materials and methods: In this 36-wk, parallel group, international RCT, adult pts with type 2 diabetes, no insulin for ≥90 days, HbA_{1c} ≥7.5% and ≤12.0% on at least 2 oral antihyperglycemic drugs (OAD) were assigned to prestudy OADs plus dinnertime insulin lispro mix 50 (LM50) (50% insulin lispro/50% insulin lispro protamine suspension) or morning insulin glargine (G). Injections were added (1-2 more in LM50, 1-3 lispro in G+L) to achieve premeal BG 4.4-5.6 mmol/L. The primary objective was to show noninferiority in HbA_{1c} change from baseline (upper limit of the 95% CI of treatment difference in HbA_{1c} [LM50 group minus insulin glargine+lispro (G+L) <0.3%]). The Expectations About Insulin Therapy Questionnaire (EAITQ) was administered at Week 0; Experiences With Insulin Therapy Questionnaire (EWITQ) at Week 36. Questionnaires consisted of 15 corresponding items (insulin therapy and insulin delivery system) summarized into positive, negative and self-efficacy subscales.

Results: Baseline HbA_{1c} was similar (LM50 9.3; G+L 9.2%; p=.11). The majority of pts (286/469~61%) were on >1 injection at study end (median=2 in both groups). Between-group difference in HbA_{1c} change from baseline to endpoint was 0.17% (95% CI -0.03 to 0.37), not meeting pre-specified noninferiority criteria. No difference was seen in endpoint HbA_{1c} (LM50 7.7; G+L 7.5%, p=.1). Overall hypoglycemia rates (adjusted for 30 days) were similar except at endpoint (LM50 1.6; G+L 2.2, p=.02). The main devices used were HumaPen Luxura (87%) (LM50) and OptiClik, OptiSet, OptiPen Pro 1 or Optipens (82%) (G+L). No EAITQ between–group differences were noted. EWITQ between-group differences are shown below.

Table: EWITQ Subscale Negative Positive Self-efficacy

LM50		G+L		p-value (ANOVA)
n	Mean±SD	n	Mean±SD	
227	2.4±1.3	225	2.6±1.3	.15
227	6.2±0.8	225	6.0±0.9	.02
227	5.8±1.0	225	5.8±0.9	.58

EWITQ items showing between-group differences in overall 7-category rating for LM50 vs G+L were: Taking insulin makes me feel better (79% vs 88% slightly to strongly agree, p=.04); My insulin delivery system is physically painful (77% vs 70% slightly to strongly disagree, p<.01); My insulin delivery system is easy for me to use away from home (87% vs 76% slightly to strongly agree, p=.01); My insulin delivery system is convenient (93% vs 86% slightly to strongly agree, p=.01); It's easy to get the dose I need with my insulin delivery system (93% vs 89% slightly to strongly agree, p=.04).

Conclusions: HbA_{1c} was reduced from baseline with LM50 and G+L but noninferiority in HbA_{1c} was not met. EWITQ scores suggest that LM50 pts may have had a more favorable experience with their insulin therapy that was associated with the insulin delivery system.

Conflict of interest:
Stock ownership: Liza L. Ilag, Xuejing Mao, Margaret Campbell, and Clarice Hayes are stockholders of Eli Lilly and Company.
Employee: Liza L. Ilag, Xuejing Mao, Margaret Campbell, and Clarice Hayes are employees of Eli Lilly and Company.

P-1435

Superior outcome of once-daily initiation with BIAsp 30 as compared to insulin glargine in Asian subjects with type 2 diabetes inadequately controlled with oral anti-diabetic drugs: subgroup results of the OnceMix trial

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Aims: To compare the efficacy and safety of biphasic insulin aspart 30 (BIAsp 30) and insulin glargine (glargine), administered once daily in Asian subjects with type 2 diabetes mellitus (T2DM) inadequately controlled with oral anti-diabetic drugs.

Methods: In the 26-week, open-labeled, randomized, parallel-group, multinational, treat-to-target trial, 155 insulin naïve Asian subjects (at baseline: 76 BIAsp vs. 79 glargine; mean diabetes duration 8.62 vs. 8.60 years, HbA_{1c} 8.47 vs. 8.44%, BMI 26.51 vs. 27.25 kg/m^2, respectively) from a global cohort of 480 subjects were randomized to receive either BIAsp 30 before dinner or glargine at bedtime, both in combination with metformin and glimepiride. Efficacy was assessed by measurements of HbA_{1c} and self-measured plasma glucose (SMPG), while safety was evaluated by incidence of hypoglycaemic episodes and adverse events (AEs), and change in body weight.

Results: After 26 weeks, lower HbA_{1c} was observed with BIAsp 30 (7.25±0.13%) than with glargine (7.60±0.13%). Analysis of change in HbA_{1c} from baseline to end of treatment showed BIAsp 30 was superior compared to glargine (BIAsp 30–glargine = -0.36%, 95%CI [-0.64;-0.07], p=0.015). Mean SMPG at bedtime was significantly lower with BIAsp 30 than with glargine (BIAsp 30 vs. glargine: 7.98±0.34 vs. 9.16±0.33 mmol/L, BIAsp 30–glargine = -1.18 mmol/L, 95%CI [-2.05;-0.32], p=0.0078). Overall hypoglycaemic rates were low in BIAsp 30 (225 episodes, 36 subjects) and glargine (168 episodes, 32 subjects), and mostly minor/symptomatic. Major hypoglycaemic episodes were few in BIAsp 30 (1 episode, 1 subject) and glargine (3 episodes, 2 subjects). There was a trend for slightly increased risk of overall minor hypoglycaemia (BIAsp 30 vs. glargine: 39.5% vs. 30.4%, p=0.081) and daytime hypoglycaemia (BIAsp 30 vs. glargine: 5.3 vs. 3.7 episodes/year, p=0.064). No difference was observed in incidence of nocturnal hypoglycaemia. The occurrence of treatment emergent AEs were comparable in both groups (BIAsp 30 vs. glargine: 56.3 vs. 58%). The majority of AEs were mild in severity: 77 of total 94 events with BIAsp 30 and 101 of total 119 events with glargine. The difference of increased body weight was not significant between the two groups (BIAsp 30 vs. glargine: 0.8 vs. 1.2 kg, p = 0.3556).

Conclusion: In insulin-naïve Asian subjects with T2DM, BIAsp 30 administered once-daily is a more effective and equally safe option for insulin initiation compared to glargine.

Conflict of interest:
Paid lecturing: W.M. Wan Bebakar, Universiti Sains Malaysia
M. Mumtaz, Penang Medical College
Stock ownership: F. Søndergaard, Novo Nordisk A/S
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P-1436

Feasibility and effectiveness of camp based diabetes care and insulin initiation in India.

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Aims: This paper reports the efficacy, results and feasibility of providing good quality diabetes care, including insulin initiation, through a camp based strategy, using trained primary care physician in India.

Methods: The national HbA1c screening and control programme was a prospective study conducted at 77 primary care centres across the country, by physicians who had earlier been trained in diabetes care. 1794 patients who visited free, pre-advertised diabetes camps underwent a baseline fasting (FPG), postprandial glucose (PPG), and HbA1c estimation. They were prescribed appropriate diet, exercise, lifestyle and pharmacological therapy.

Results: 740 patients at 34 centres, including 59.1% men and 40.9% women, with a mean age of 54.5±11.0 yrs and a mean duration of diabetes of 6.91±5.3 yrs, who presented for investigations at repeat camps 3 months later, were taken for analysis.

All patients were given dietary, exercise and lifestyle advice. 20.7% were prescribed insulin monotherapy, 45.5% took oral hypoglycemics and insulin in combination, while 33.7% were advised only oral drugs. The mean dose of insulin was 26.3±11.9 U/d at final visit, with 95% on premixed insulin (35% conventional insulin; 60% premixed aspart), 3% on bolus insulin and 2% on basal insulin. Mean HbA1c got reduced by 0.87±1.75% (Baseline 8.65%; Final visit 7.79%) in the complete cohort (p<0.001). Over 3 months FPG and PPG fell from 157.30 to 136.30 mg/dl (p<0.001) and from 256.70 to 213.80 (p<0.001) respectively in complete cohort. HbA1c reduction was -0.63% in the oral hypoglycemics group, -0.83% in the insulin monotherapy, and -0.91% in the combination group, with all values being highly significant (p<0.001). FPG and PPG reduction were most in the insulin group (-38.29 and -79.31 mg% respectively). The proportion of patients with HbA1c ≤7.0% rose from 38.20% to 59.60% (p<0.001). Of these 31.6% were taking oral drugs, 27.9% insulin monotherapy, and 40.4% were on combination therapy. A total of 63 hypoglycemic events were reported with highest incidence in combination group.

HbA1c reduction was greater in patients on premixed aspart (-1.44%) than conventional premixed insulin (-0.69) (p<0.001), while hypoglycemia was less common in the aspart-treated group. Though the mean daily insulin dose was similar in both groups (26.44 U aspart, 26.5/U conventional), the mode was lower with aspart (20U/d in 14.9% patients) than with conventional insulin (30U/d in 20.8%)

Conclusions: This study highlights the feasibility and effectiveness of camp-based diabetes care and insulin initiation in primary care centres. It demonstrates the efficacy, safety and utility of premixed aspart in such settings.

Conflict of interest:
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P-1437

Average daily dose of analog basal insulins in patients with type 2 diabetes: a matched case control analysis

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Aims: Insulin is a recommended treatment option in patients with type 2 diabetes (T2D) who fail to maintain glycemic control on oral antidiabetic drugs. Insulin dose is patient specific and driven by blood glucose control. The purpose of this study was to compare the average daily dose of insulin detemir to insulin glargine in a matched cohort of patients with type 2 diabetes (T2D) to determine if the mean daily dose in the real-world setting differs between these products.

Methods: Patients with T2D (per ICD-9 code 250.x1 250.x3) were identified in the Verispan Electronic Data Warehouse (SDI, Plymouth Meeting, PA) from 7/1/2006 to 6/31/2007. Verispan data has an open architecture and does not include eligibility data, but filtering techniques were employed to eliminate cohort shrinkage. Insulin naïve patients started on detemir (cases) were matched 1:1 to newly treated glargine patients (controls) for baseline characteristics that could influence dose requirements including gender, age (± 2 years), baseline antidiabetic therapy (by classes of oral agents, and exenatide), and comorbidities including cerebrovascular disease, renal failure, heart failure, heart disease/myocardial infarction, hypertension, neuropathy, and obesity. Patients were not prescribed any other insulin during the observation period. The average daily insulin dose in units was calculated as the number of units dispensed from the first to the second to last prescription in the observation period divided by the elapsed days from the first to last fill. A Wilcoxon rank sum test was used to identify differences in the average number of units per day between detemir and glargine. Changes in antidiabetic therapy by class and number of agents after insulin initiation were identified and compared between cases and controls using chi-squared tests.

Results: Of 2215 newly treated patients with T2D, 1581 (71.4%) were matched to a glargine patient. Mean age of this matched cohort was 59.4 years; 53.5% were female. Metformin (57.1%) and sulfonylureas (51.6%) were the most commonly used antidiabetic agents at baseline; 45% were on 1 or 2 non-insulin antidiabetic agents at baseline. The most common comorbidities were hypertension (57.6%) and heart disease/myocardial infarction (15.4%). The mean (median) of the average daily insulin dose was 35 (26) units per day for detemir and 32 (27) units per day for glargine; which was not significantly different (p=0.15). There were no differences in concomitant antidiabetic drug use from baseline to follow-up which could have influenced insulin dose requirements.

Conclusion: The mean daily insulin dose for detemir did not differ from glargine in patients with T2D matched on baseline characteristics that could influence insulin dose requirements.

Conflict of interest:
Stock ownership: J. Bouchard, NovoNordisk, Inc. M. Aagren, NovoNordisk, Inc.
Employee: J. Bouchard, NovoNordisk, Inc. M. Aagren, NovoNordisk, Inc.
Commercially-sponsored research: D. Brixner (PI), NovoNordisk, Inc.

P-1438

The need for specific assays of insulin analogues

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Aims: Most assays for insulin cross-react to varying degrees with insulin analogues making distinction between insulin analogues and human insulin difficult. Currently there are no commercially available specific assays for the short acting insulin analogues aspart and glulisine. The aim of this study was to compare specific assays for the insulin analogues aspart and glulisine with the results obtained from an immunochemiluminometric insulin assay (Invitron ICMA).

Methods: A total of 66 samples were collected for assay taken from 19 Type 2 diabetic subjects who received subcutaneous injection (0.2U/kg) of either aspart or glulisine on 2 separate study days. Low and high insulin analogue concentration plasma samples were taken on both days. Both the doses of the 2 insulin analogues and the sample timepoints were kept the same to maintain comparability. 33 plasma samples were assayed using a specific aspart assay (Capio/Unilabs ELISA) and 33 using a specific glulisine assay (Linco RIA). All samples were then also assayed using an insulin assay (Invitron). Further samples were also assayed for C-peptide (Invitron ICMA) in order to determine endogenous and exogenous insulin using the initial ratios method: $Insulin_{exogenous} = Insulin_{observed} - F \times C\text{-}peptide_{observed}$ (where F is the ratio of basal insulin and C-peptide levels)

Results:

Analogue	Specific assay result (pmol/L) Mean (SD)	Invitron insulin result (pmol/L) Mean (SD)	Calculated exogenous insulin (pmol/L) Mean (SD)	% Bias-calculated exogenous vs. specific insulin (95% CI)	% Cross reactivity of Invitron vs. specific assay Mean (SD)
Aspart	185.8 (182.3)	340.0 (227.1)	304.0 (255.3)	+58.3 (42.3 to 74.4)%	239.8 (239.7)%
Glulisine	326.0 (231.8)	349.8 (159.3)	315.2 (184.8)	-0.4 (-13.3 to 12.5)%	107.3 (45.0)%

Discussion: Our results showed that when comparing specific assay data for aspart and glulisine, there was a 47.7 (44.6)% difference between the mean concentration of the two analogues, despite the consistency in both the dose administered and the sample timepoints. Conversely, there was only a 9.2 (33.8)% difference between mean concentrations measured in the Invitron assay and only a 2.1 (2.96)% difference between mean calculated aspart and glulisine.

This study highlights the difficulty in comparing insulin analogue levels when assayed using different methods, and that care must be taken when interpreting the results. As the use of insulin analogues increases, including the use of multiple analogues, accurate, robust, specific assays for insulin analogues, with no cross-reactivity to either human insulin or other insulin analogues need to be made available.

Conflict of interest:
Stock ownership: Stuart Woodhead

P-1439

Insulin detemir was effective for better control of diabetes and reducing weight among Japanese

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We conducted a multi-centered study of insulin Detemir to verify the effectiveness on controlling diabetes, approved by the ethical committee and performed with informed consent by the patients. Our subjects were type 1 and 2 diabetic patients whose control was stable for the previous 3 months without changing therapy of four or more daily insulin injections. We replaced their basal insulin to Detemir and monitored them for 6 months. The insulin dose was fixed for the first 3 months and adjusted thereafter to achieve the target of HbA1c less than 6.5 %. Also the questionnaire of insulin therapy related Quality of Life (ITR-QoL) was performed before and 6 months after the study. Mean age, 49.9y/o, duration of illness,15.7ys, and BMI was 23.2. HbA1c at beginning was 7.5%. Dose of insulin is 45.6U/d (0.76U/kg), with basal insulin 15.8U/d (35.8%). 56 had used Insulin Glargine, and 38 had used NPH insulin as basal insulin. Mean HbA1c from1 month to 6 months were; 7.6 (n.s. by t test with HbA1c at 0 month), 7.5 (n.s.), 7.6 (n.s.), 7.4 ($p<0.003$), 7.3 ($p<0.003$), 7.3 ($p<0.001$) %, respectively. Significant declines after 3 months were seen only among the group whose previous basal insulin was NPH, but not Glargine. Total dose and the basal rate of insulin significantly increased after 4 months. BMI decreased significantly 4 months later. 19 had injected basal insulin twice and continued to inject Detemir twice daily. 11 who had previously injected basal insulin once daily had to inject Detemir twice daily. Dose and basal rates of insulin were higher among the group that injected twice than the group that injected once. According to QoL indexes, 'emotion of treatment', 'hypoglycemia at bedtime and early morning' and 'control at pre-breakfast' improved significantly when Detemir was used. Pain scores of

injection were significantly higher among the Glargine group than the NPH injecting group, but significantly decreased after administering Detemir. In conclusion, replacing basal insulin from NPH to Detemir improved their control. Detemir tended to decrease body weight even among Japanese people whose average BMI was 23.

No conflict of interest

P-1440

Insulin therapy does not interfere with endothelial function evaluation in patients with type 2 diabetes mellitus (T2DM)

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Improvement of endothelium-dependent dilation was previously shown in T2DM patients submitted to insulin therapy, but this effect was probably due to improved glycemic control.
Aim: To compare endothelium-dependent dilation in patients with T2DM with good metabolic and blood pressure control using or not insulin as part of their therapy.
Methods: We studied 16 patients with T2DM treated with anti-diabetic agents (C, 8 women) and 8 with insulin alone or in combination with anti-diabetic agents (Ins, 3 women), 60.0 ± 5.6 years-old, body mass index 26.3 ± 2.9 kg/m^2. Both groups had HbA1c < 7.5%, no dyslipidemia or nephropathy and systolic blood pressure lower than 150 mmHg. Endothelial function was evaluated by the dorsal hand vein technique, which measures changes in vein diameter in response to phenylephrine, acetylcholine (endothelium-dependent vasodilation) and sodium nitroprusside (endothelium-independent vasodilation).
Results: Age (p=0.66), body mass index (p=0.33), systolic blood pressure (129.4 ± 11.8 vs 133.8 ± 10.3 mmHg, C and Ins, respectively, p= 0.36), HbA_{1c} (6.6 ± 0.6 vs 6.5 ± 0.8 %, C and Ins, respectively, p= 0.95), total cholesterol (p=0.74), triglycerides (p=0.84) and urinary albumin excretion (9.1 ± 9 vs 10.3 ± 6 mg/24h, C and Ins, respectively, p=0.72) were similar between groups. There were no differences between endothelium-dependent vasodilation of C (59.3 ± 26.5%) vs Ins (51.4 ± 16.4%), p=0.38. Endothelium-independent vasodilation was similar between C (113.7 ± 35.3%) and Ins (116.4 ± 24.9%), p=0.83.
Conclusions: Insulin therapy did not influence vascular function in T2DM patients under stable glycemic and blood pressure control.

No conflict of interest

P-1441

Comparison of insulin infusion protocols by using time-dependent insulin action model

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Aims: Insulin infusion has been recommended to use in critically ill patients at an in-patients setting to obtain reasonable plasma glucose concentration. However there are many protocols for insulin infusion. It is difficult to compare insulin infusion protocols, because you cannot re-try in the same setting. We have recorded insulin and glucose infusion rate, and plasma glucose concentration during insulin infusion procedures, and applied this time dependent change to a mathematic model which expressed insulin action by time-dependent two parameters. Using this model, we virtually applied insulin infusion protocols to compare the effectiveness and safety of such protocols.
Methods: The model was expressed by an insulin-dose dependent line which was determined by insulin resistance index (IRI-abs: how many units of insulin per hour is necessary to keep plasma glucose conc.) and insulin sensitivity index (ISI-del: decline of plasma glucose conc. by infusion of one unit insulin per hour). The relation was plotted on a graph (X: insulin infusion rate, Y: delta PG), and ISI-del and IRI-abs (which are time-dependent variables) were identified. Glucose infusion was assessed by the distribution of glucose space, and converted to the difference of PG which is approximated in addition to Y. Mathematically this is written as Y = - (ISI-del (t)) x (X - IRI-abs (t)). Next estimated PG = Current PG + Y. By using this model, Yale Univ. protocol, Braithwaite method, and Davidson's method were compared.
Results: Data from 50 cases (subjects) (age: M/F = 25/25, age = 54 ± 12 y.o., BMI = 24 ± 5 kg/m^2) were re-analyzed. Total time under reconstructed and deconvolution was 3,000 hours. Averages PG were 95, 110, and 97 individually. Frequency of hypoglycemia lower than 50mg/dl of PG were 5, 12 and 8 times individually. In the manual procedure of actual intervention, average PG was 113mg/dl, and frequency of hypoglycemia was twice.
Conclusion: In the protocols analyzed, Yale Univ. protocol was most effective and safe. Despite of its complicated protocol, it may be a choice to use Yale Univ. protocol. Although there is a limitation, it also may be possible to apply a procedure by obverting graphic change of insulin action. Thus manual intervention by obverting graphic change of insulin action would be an alternative choice, and further validation would be conducted.

No conflict of interest

P-1442

Characteristics of anti-insulin antibodies on Scatchard analysis and daily profiles of plasma glucose

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Aim: We analysed how characteristics of anti-insulin antibodies are related to daily profiles of plasma glucose in insulin-treated diabetic patients.
Objects: We evaluated anti-insulin antibodies by K1 affinity constant at the high-affinity range and bound-to-free (B/F) ratio with Scatchard plot analysis. Antibodies in 4 male and 3 female patients (Mean age:65.4±9.1) with type 2 diabetes complicated by poor glucose control because of anti-insulin antibodies were analyzed. All patients were treated with daily insulin injections.The levels of their fasting immunoreactive insulin (IRI) were very high (270-1900μU/ml), and the levels of non-specific binding capacity of their anti-insulin antibodies were also high (54-95%).
Result and discussion: Our patients with anti-insulin antibodies showed two patterns of glucose levels. Insulin resistance and plasma glucose levels were increased in 4 cases, in which 2 cases had high K1 (>0.14), and the other 2 cases had low K1 (<0.03) and high B/F ratio (>1.0). Glucose levels were unstable with early-morning hypoglycemia and hyperglycemia in the rest of a day in the other 3 cases, who had low K1 (<0.06) and low B/F ratio (<0.8).
Conclusion: These results indicate that the affinity and the binding capacity of anti-insulin antibodies have effects on insulin resistance and glycemic instability of insulin-treated diabetic patients.

No conflict of interest

P-1443

Why does diabetes therapy often fail?

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Introduction/aims: The total cost of diabetes in the United States will approach $200 billion per year by the year 2020. National guidelines recommend HbA1c to < 7% long term and treating BP and lipids. However, conditions are not currently met. The hard facts: outcomes are still dismal and women with diabetes are still dying hard. Even if they monitor blood glucose they often do not adjust their insulin doses due to fear of hypoglycemia and weight gain. Our hypothesis was using Humalink software system would help

find patient, or provider, or disease related factors which may explain why most patients are still not well controlled.

Methods:

1. Software: Humalink system is a well proven, validated software for better glycaemic control applied in more than 1800 patients.
2. Patients: 87 insulin treated diabetics who were insulin pump therapy candidates because of poor glycaemic control (HgA1c>9%, Gl>250 mg/dl), were offered Humalink software via a touchtone telephone, in preparation for insulin pump therapy.
3. Protocol: Patients were asked to call 4 BGSM values twice weekly. Instantly, the system analyzed their previous glucose profile data (up to 90 days), gave an instant response with modifications on insulin am or pm dose (rapid or intermediate). After patient agreed to the protocol, we quantified before and after 12 months intervention metabolic outcome measures and the following provider/patient outcome measures: 1) Patient related factors: Compliance with the protocol (initiating use of the system), Adherence (persistent regular use after initiation) 2) Provider related factors (patients who became well controlled by the system, after provider inability to achieve optimum control). 3) Disease related factors (patients who continued to have poor control and needed Insulin pump).

Results: Non-compliance was seen in 31% of patients (27 of 87 dropped out soon). Of the 60 compliant patients non-adherence was seen in 10% (6 of 60 did not use the system regularly). Of the 54 adhering patients 97.2% improved in all parameters, indicating provider related factors which was appropriately corrected by Humalink not needing insulin pump. Only 2.% did not improve despite good compliance and adherence indicating disease related factors, and clearly representing the best candidates for insulin pump. Improved outcome measures included decreased: 1) FBS from167 to 140 mg/dl. 2) 2HPP glucose from 194 to 152. 3) HbA1c from 9.7% to 7.9%. 4) Fructosamine from 348 to 294. All changes are significant at P value <0.001. For comparison in the non users of the system HbA1c increased 0.4% with absolute difference of HbA1c :2.2% (for comparison oral agents %.5 -1.1).

Conclusion: The three factors in failure of diabetes therapy are: patient related factors (41%) including non compliance (31%), non adherence (10%), provider related factors (57%), disease related factors (2%) which benefits best from the pump if expense covered. Using Humalink may help decrease cost by billions of dollars while improving quality.

No conflict of interest

P-1444

Resource utilization and cost comparison among type 2 diabetes patients using either insulin glargine or insulin detemir: a German claims data analysis

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Aims: Little is known on resource utilization and costs incurred by type 2 diabetic (T2D) patients treated with basal insulin analogues in Germany. The aim of our analysis was to compare prescription drug use, inpatient days for any reason, emergency services, and related costs in T2D patients using either insulin glargine (GLA) or insulin detemir (DET).

Methods: A retrospective cohort study based on pseudonymized claims data provided by a large German sickfund was conducted using propensity score matching. Propensity scores were quantified via regression analysis using patient and physician characteristics. Patients with an equal propensity score taking either GLA or DET were matched for comparison. The primary outcomes consisted of prescription drug use, the number of inpatient days, and related costs during the period from 1/1/2005 until 12/31/2005. Statistics were performed using the non-parametric Mann-Whitney U test. Differences in outcomes between GLA and DET users were regarded statistically significant with a two-sided p<0.05.

Results: Of the 1,051,842 continuously enrolled beneficiaries of the sickfund, 385 GLA and 382 DET users remained after matching. Outpatient prescription drug use was lower by 228 EUR in GLA users compared to DET users (mean costs 2578 vs. 2806 EUR, p=0.001). Costs of outpatient prescription drugs related to diabetes treatment also differed by 305 EUR in favour of GLA users compared to DET users (mean costs 1275 vs. 1580 EUR, p=0.001). There was no meaningful difference in costs of outpatient prescription drugs unrelated to diabetes treatment between GLA and DET users (mean costs 1303 vs. 1225 EUR, p=0.977). Inpatient days for any reason were not different between the GLA and DET groups (mean 7.65 vs. 9.13 inpatient days, p=0.384). There was a lower utilization of emergency services by the GLA group compared to the DET group with a mean of 0.01 vs. 0.16 days (p=0.029) and with mean costs of 2.91 vs. 27.17 EUR (p=0.029) for drugs prescribed by emergency physicians. Further exploratory analyses showed that GLA users accumulated lower cost for short-acting insulin analogues (mean costs 277 vs. 460 EUR, p<0.001) and for blood glucose test strips (mean costs 288 vs. 363 EUR, p=0.045) compared to DET users.

Discussion/conclusion: This analysis of a real-world setting represented by claims data showed considerably lower costs of all outpatient drugs as well as of drugs related to diabetes treatment per T2D patient per year in the group of GLA users compared to the group of DET users. Resource consumption for emergency services differed also in favour of GLA. Propensity score matching is well suited to adjust for known confounders. Hence, a practice-panel survey should be undertaken to evaluate the impact of those confounders, which might not be covered by the present study design.

Conflict of interest:
Employee: PK Schädlich, EG Hagenmeyer, H Gothe, A Höer and B Häussler have done research funded through unrestricted grants by Sanofi-Aventis Deutschland GmbH.
W Landgraf is employee of Sanofi-Aventis Deutschland GmbH
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P-1445

Improved quality of life in patients with type 2 diabetes treated with Biphasic Insulin Aspart 30 (BIAsp 30): Iran subgroup of IMPROVE study

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Aims: IMPROVE™ study was carried out to evaluate the clinical profile of BIAsp 30 (30% soluble insulin aspart, 70% protamine-crystallized insulin aspart) in type 2 diabetes patients in routine clinical practice. A subgroup analysis of quality of life in Iranian patients is presented in this abstract.

Methods: IMPROVE™ was a 26-week, multinational, open-label, non-randomized study in patients with type 2 diabetes. In Iran, 478 patients (47% male), who were treatment-naïve (0.4%) or previously treated with oral antidiabetic drugs (OADs) (33.3%) and/or insulin (66.3%) participated. Mean (SD) age was 55.2 (11.8) y, mean duration of diabetes was 13.2 (8.2) y and mean body mass index was 28.1 (4.8) kg/m^2. The treatment regimen (dose of BIAsp30 and supplementary treatment if any) was at the physician's discretion.

Results: Quality of life (QoL) was measured using the Diabetes Medication Satisfaction Questionnaire (DiabMedSat) score (0 to 100-point scale with higher scores indicating higher quality of life). QoL scores at baseline and end of treatment (26 weeks) are presented in Table 1. After 26 weeks of treatment with BIAsp 30, the overall score was significantly higher than baseline (75.4 at week 26 vs. 58.1 at baseline). Also the subclass QoL scores "relief of burden", "relief of symptoms" and "effectiveness" significantly increased after treatment, particularly the score for "effectiveness" improved by 30 points (from 42.1 at baseline to 72.6 at week 26). The results were further supported by improvement in HbA_{1c}, which was significantly reduced from 8.6% at baseline to 7.4% at week 26. Similar trends were observed in patients previously treated with OAD only or insulin ± OADs (Table 1).

Conclusion: The results showed a significant improvement in the overall

score for quality of life after 26 weeks of treatment with BIAsp 30. These improvements might help to enhance the patient's adherence to the treatment and encourage them in their self-management of type 2 diabetes.

Table 1: Quality of life - DiabMedSat Score

DiabMedSat Score (SD)	All	OAD only	Insulin ± OAD
Overall			
Week 0	58.1 (12.7)	59.2 (12.6)	57.6 (12.8)
Week 26	75.4 (12.0)	75.6 (11.5)	75.3 (12.2)
Change	+17.3 (16.0)*	+16.4 (15.8)*	+17.8 (16.1)*
Relief of Burden			
Week 0	68.9 (15.8)	71.3 (14.9)	67.7 (16.1)
Week 26	83.0 (12.6)	82.9 (11.9)	83.0 (13.0)
Change	+14.1 (18.5)*	+11.6 (17.7)*	+15.4 (18.7)*
Relief of Symptoms			
Week 0	63.8 (15.8	68.1 (15.2)	61.5 (15.7)
Week 26	71.2 (15.9)	70.4 (17.9)	71.6 (14.8)
Change	+7.4 (20.2)*	+2.3 (20.8)NS	+10.1 (19.4)*
Effectiveness			
Week 0	42.1 (19.4)	38.5 (18.5)	44.0 (19.6)
Week 26	72.6 (17.3)	73.3 (16.0)	72.2 (18.0)
Change	+30.5 (25.0)*	+34.8 (24.1)*	+28.2 (25.2)*

* p<0.001

Conflict of interest:
Paid lecturing: AR. Esteghamati, M. Amini, R. Rajabian, A. Bahrami
Advisory board: AR. Esteghamati
Employee: E. Parvaresh Rizi

P-1446

A 12 week phase IV study of recombinant human regular insulin metered dose buccal spray on subjects with type 2 diabetes who are suboptimally controlled while on oral antidiabetic agents

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Background: Evidence suggests that early insulin therapy for glycemic control provides additional benefits over conventional therapy in DM. However, subcutaneous route of administration is a barrier to initiating early insulin therapy in majority of these patients. Postprandial glucose control by buccal route of insulin administration may overcome this barrier, improve glycemic control and provide further benefits.
Objective: This prospective open label phase IV multicentric study in India evaluated efficacy and safety of insulin metered dose buccal spray (Generex Oral-lyn™; Oral Recosulin™) given pre- and post-meal in adult subjects with Type 2 DM that are suboptimally controlled with oral anti-diabetic agent (s).
Methods: 40 Male and female insulin naïve type 2 adult diabetics, suboptimally controlled with oral anti diabetic agents (i.e. 6.5≥ HbA_{1c} ≤8.5) but otherwise in good general health, received insulin in addition to their OHA, by metered dose buccal spray after training, in doses ranging from 4 to 10 puffs at each meal based on their FBG, for the study period of 3 months. The main outcome measures were improvement in glycemic control in terms of changes in HbA_{1c}, and improvement in fasting and post meal glucose from baseline. Safety was assessed by monitoring changes from baseline in clinical and laboratory findings and changes in buccal cytology at the end of 3 months treatment.
Findings: Findings in 40 type 2 diabetic patients on OHA who received metered dose buccal insulin spray showed improvement in glycemic control in terms of improvement in HbA_{1c} values (Mean HbA_{1c} value: 7.8% vs 7.3%) and fall in both fasting and postmeal glucose. No significant changes were observed in clinical laboratory events and buccal cytology. Except for minor hypoglycaemic episodes, transient burning sensations and transient numbness in mouth, no other adverse effects were observed. Recombinant human regular insulin metered dose buccal spray (Generex Oral-lyn™ ; Oral Recosulin™) appears to be well tolerated and highly preferred by patients. The detail data and its finding will be presented in the meeting.
Interpretation and conclusions: Treatment with insulin metered dose buccal spray (Generex Oral-lyn™; Oral Recosulin™) in type 2 diabetes mellitus patients on OHA, resulted in glycemic improvement and was well tolerated. Oral Recosulin had high acceptability in patients.

Conflict of interest:
Employee: Jha AM, Shreya Life Sciences Pv,. Ltd.
Commercially-sponsored research: Talwalkar PG, Bhansali A, Walia R, Gupta S, Srikanta S, Chowdhury S, Rao PV and Seshiah V. Shreya Life Sciences Pvt. Ltd.

P-1447

Real-life prescription patterns show fewer treatment changes with pre-mixed insulin analogues compared to pre-mixed human insulin in patients with type 2 diabetes in the Netherlands

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Aims: Studies have suggested that pre-mixed insulin analogues may improve the balance between glycaemic control and hypoglycaemia compared with human pre-mixed insulin in patients with type 2 diabetes (T2D). This Dutch study aimed to observe prescription patterns of pre-mixed insulin analogues compared to human pre-mixed insulin among patients with T2D by: looking at proportions of patients starting either human or analogue pre-mixed insulins; comparing previous insulin experience; and establishing how many patients changed treatment during the first year of treatment.
Methods: The Dutch PHARMO database includes community pharmacy drug dispensing records and clinical laboratory measurements from approximately 2.5 million patients. Data for patients with T2D who started using pre-mixed insulin in the period 2004–2006 were extracted, and patients were categorised into insulin-naïve users (no insulin in the previous year) and prior insulin users. In addition, the proportion of patients changing treatment within one year was determined.
Results: The study included 3530 new users on pre-mixed insulin, of which 2324 (65.8%) were naïve to insulin. Overall, 2134 (60.5%) started on analogues; the proportion of analogue users was greater among prior insulin users (812 of 1206 = 67.3%) vs. naïve users (1322 of 2324 = 56.9%). In prior insulin users, a significant difference in baseline HbA_{1c} was observed between those using human pre-mixed insulin (8.5%) and pre-mixed analogue (8.0%, p<0.001). Other patient characteristics did not differ between human insulin and analogue users. Within one year, 44.1% of human pre-mixed insulin users and 33.5% of pre-mixed analogue users changed their treatment. The changes made and average time to change were recorded: among human pre-mixed insulin users 20.1% discontinued treatment (230 days), 6.5% added a fast-acting insulin to their therapy (114 days), and 17.6% switched treatment (143 days); among pre-mixed analogue users 14.9% discontinued treatment (245 days), 5.8% added a fast-acting insulin to their therapy (137 days), and 12.9% switched treatment (155 days).
Conclusion: When insulin treatment was initiated, pre-mixed insulin analogues were more frequently prescribed by Dutch physicians than human pre-mixed insulin. Users of pre-mixed insulin analogues neither discontinued nor switched therapy as frequently as human pre-mixed insulin users, suggesting that pre-mixed insulin analogues gave a more sustained and satisfactory result.

Conflict of interest:
Employee: Thomsen, Christensen: Novo Nordisk.
Commercially-sponsored research: This study was supported by an unrestricted grant from Novo Nordisk, Bagsvaerd, Denmark

P-1448

Blood glucose variability in type 2 diabetic patients on different basal insulin preparations

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Background and aims: There are strong evidences of a close linear relationship between average glycaemia during 3 months and HbA1c at the end of this period. However the blood glucose (BG) excursions can considerably differ in patients with the similar HbA1c level. We aimed to find any (if at all) difference in blood glucose variability (BGV) in patients on various basal insulin regimens.

Materials and methods: We studied 61 Type 2 diabetic (T2D) patients on glargine once a day (I, N=18), NovoMix twice daily (II, N=20) or NPH twice daily (III, N=23) with pretty strict glycaemic control (HbA1c<7,5%). Three groups were matched for age, gender, BMI and diabetes duration. No significant differences between groups in HbA1c were found. The BGV was assessed from 3 days continuous glucose monitoring (CGM). CGM system high limit of BG was fixed on 9,0mmol/l, low limit on 4,0mmol/l. Episodes of hypoglycaemia were registered either they were symptomatic and BG below normal range, or asymptomatic and BG below 2,5mmol/l.

Results: The duration of CGM was around 72 hours with no differences in the number of sensor values between groups. In the course of CGM an average BG was 8,5mmol/l, 8,6mmol/l and 8,6mmol/l; BG min-max deviations: 2,7 – 11,5mmol/l, 3,1 – 10,6mmol/l, and 2,2 – 14,6mmol/l in I, II and III group respectively. The table shows CGM results (values are presented as Mean±SD).

see table 1

Hypoglycaemias were rare, no severe episodes were seen. Despite the proved difference in duration of BG below low limit between groups they were comparable in clinically remarkable hypoglycaemic events.

Conclusions: BGV in T2D patients with equal HbA1c could be significant. The minimal BG excursions were found on NovoMix twice daily and the most meaningful were on NPH twice daily. How much BGV is clinically important remains unclear and needs further study.

No conflict of interest

P-1449

Improved safety and efficacy profile in patients with type 2 diabetes treated with biphasic insulin aspart 30 (BIAsp 30): IMPROVE Korea study

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Aims: To investigate clinical safety and efficacy of biphasic insulin aspart (BIAsp30) administered once- or twice-daily in Korean patients with type 2 diabetes.

Methods: This was a 26-week, open-label, multi-centre, observational study in Korean patients with type 2 diabetes to evaluate the safety and efficacy of BIAsp30 in daily clinical setting. Data were collected at baseline and final visit (26 weeks).

Results: 645 patients (mean age: 56.6 ± 12.5 years, mean BMI: 24.8 ± 4.0 kg/m^2, mean diabetes duration: 11.0 ± 8.6 years, mean HbA_{1c}: 9.7 ± 2.0%) were enrolled. Of which 16.0% were treatment naïve, 35.8% were previously treated with oral antidiabetic drug (OAD) only, and a large portion of patients (48.2%) were treated with insulin ± OAD. After entering into the study, 53.5% and 37.8% of patients were initiated with BIAsp30 only and with OAD, independently. At the final visit, majority (56.4%) of patients were receiving BIAsp30 + OAD. During the study, a total of 10 (1.6%) adverse drug reactions (ADRs) and 6 (0.9%) serious ADRs were reported. Among 9 serious adverse events (SAE), only 6 cases were probably associated with BIAsp30. The proportion of patients who reported major hypoglycaemic episodes decreased over time (baseline vs. final visit: 2.7% vs. 0.2%, p<0.001). In contrast, incidence of minor hypoglycaemic episodes increased from 11.8% at baseline to 24.5% at final visit (p<0.001). HbA_{1c} was significantly reduced from baseline to final visit by 1.24 ± 2.22% (p<0.001). An increase of more than 2 fold was observed in the proportion of patients who achieved the glycaemic target of HbA_{1c}<6.5% (baseline vs. final visit: 2.0% vs. 5.1%), while the proportion of patients achieving HbA_{1c}<7.0% almost doubled (baseline vs. final visit: 5.9% vs. 11.5%). FPG was significantly reduced from baseline to final visit by 2.31 ± 5.05mmol/L (p<0.001). Change of mean body weight was 0.97 ± 3.41 kg at final visit (p<0.001). However, treatment naïve patients took almost part in the increase of body weight. The overall total DiabMedSat score (which indicated patient's quality of life) after 26 weeks of treatment with BIAsp30 was significantly higher (baseline vs. final visit: 63.4 vs. 68.3, p<0.001).

Conclusion: In Korean patients characterized with long duration of type 2 diabetes and poorly controlled even under more intensive therapy, treatment with BIAsp30 significantly improved glycaemic control and quality of life, while not increasing the incidence of major hypoglycaemic episodes.

Conflict of interest:
Paid lecturing: S. W. Kim for Sanofi-Aventis. J. T. Woo for Norvatis and Sanofi-Aventis. H. A. K Jang for Sanofi-Aventis. Y. B. Ahn for Sanofi-Aventis. D. J. Kim for Sanofi-Aventis. J. H. Noh for Sanofi-Aventis and Lilly. K. S. Park for SA and MSD. Advisory board: S. W. Kim for Sanofi-Aventis. J. T. Woo for Novo-Nordisk, MSD and Novartis. H. A. K Jang for CKD and Handok. Y. B. Ahn for Astrazenecca. J. H. Noh for MSD.
Employee: S. R. Lee for Novo Nordisk Pharma Korea

P-1450

Analysis of glycemic control outcomes vs. baseline in patients treated with analog basal insulin in a real-world setting

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Aims: In clinical trials, change in A1C is often associated with baseline A1C; the higher the baseline value the greater the reduction with treatment. Both insulin detemir and insulin glargine have demonstrated improved glycemic control for patients with diabetes mellitus (diabetes) in controlled clinical trials. This study compares A1C outcomes vs. baseline in patients treated with detemir and glargine in a real-world, ambulatory care setting.

Methods: Patients with diabetes were identified from the General Electric electronic medical record (EMR) research database (GE Centricity) from September 1, 2004 to April 30, 2008. Patients were 18+ years, insulin naïve, newly treated with detemir or glargine mono-insulin therapy. Index date was defined as the date of the first detemir or glargine prescription. Patients were continuously active in the EMR for 395 days pre to 270 days post-index date and had no other insulin orders in the follow-up period. Baseline A1C was identified 45 days pre to 15 days post-index date. Both baseline and change

Table 1

Index	Groups			p-value		
	I	II	III	I/II	I/III	II/III
HbA1c (%)	7,21±0,25	7,19±0,24	7,23±0,24	>0,5	>0,5	>0,5
# of sensor values	870,56±11,59	868,60±15,31	872,26±13,76	>0,5	>0,5	>0,4
Duration above high limit (%)	11,28±4,44	8,50±3,36	14,35±3,77	0,04926	0,03112	0,00019
Duration below low limit (%)	20,22±6,45	15,95±5,34	25,00±7,90	0,03122	0,04731	0,00094
Duration within limits (%)	68,50±5,86	75,55±5,29	60,65±9,92	0,01625	0,01938	0,00087

in A1C from baseline to 6 month (±90 days) were compared between detemir and glargine using independent t-tests. A linear regression analysis was used to adjust A1C outcomes for age, gender, region, baseline A1C, diabetes type, baseline BMI, and hypoglycemic events.

Results: Of the 6570 patients who met study inclusion criteria, 308 (4.7%) were started on detemir and 6262 (95.3%) on glargine. Mean (±SD) age was 58.7±12.7 years and did not differ by insulin. A total of 46.4% of detemir patients were female versus 49.6% of glargine patients (p<.001). Of those with A1C data (n=198; 64% for detemir, n=3881; 62% for GLAR) baseline A1C was significantly higher for glargine (9.2±1.9%) than for detemir (8.8±1.9%; p=0.003). Mean change in A1C from baseline to 6 months in those with A1C data was -1.1±2 for detemir vs. -1.4±1.9 for glargine (p=0.12). When controlling for multiple baseline characteristics the mean change in A1C also did not differ between detemir (-1.5%; 95% CI -1.6 – -1.3) and glargine (-1.3; 95% CI -1.4 – -1.3).

Conclusion: Although changes in A1C with antidiabetic drug treatment are often positively associated with baseline A1C in clinical trials, glycemic control outcomes in those treated with the basal analog insulins detemir or glargine in a real-world setting were similar despite higher baseline A1C for glargine patients.

Conflict of interest:
Stock ownership: Jon Bouchard, NovoNordisk, Inc. Mark Aagren, NovoNordisk, Inc
Employee: Jon Bouchard, NovoNordisk, Inc. Mark Aagren, NovoNordisk, Inc
Commercially-sponsored research: Diana Brixner, NovoNordisk, Inc.

P-1451

Evaluation of first insulinization by administration of basal insulin in Asian patients with type 2 diabetes

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Aim: FINE Asia (First Basal Insulin Evaluation in Asia), a multinational, prospective observational study, assessed the use of basal insulin in insulin-naïve Asian Type 2 diabetes (T2D) patients (age≥20y), uncontrolled (HbA_{1c}≥8%) on oral antidiabetic drugs (OADs).

Methods: Basal therapy was assessed at 6 months by doctors (Drs) and patients, on a 4-point scale (not good, moderate, good, very good). Treatment choices were at the Dr's discretion to reflect real-life practice. Patients with both baseline and 6-month HbA_{1c} data were included and analyzed.

Results: 2679 patients from 11 Asian countries: 50% male; mean±SD age, 56±11y; BMI, 26.1±4.7kg/m^2; T2D duration, 9±6y; OAD duration, 9±6y. 2016, 589 and 61 patients started glargine, NPH and detemir, respectively. Results (overall and categories by insulin type) are shown in the Table. Overall reductions in HbA_{1c} (9.8 to 7.7%) and FBG (210 to 129mg/dL) were seen after 6 months of basal insulin; 33.7 and 36.9% patients reached HbA_{1c}<7% and FBG<110mg/dL, respectively. Significant differences between insulins were seen (Table). Significantly higher No. of patients on glargine reached HbA_{1c}<7% and FBG<110mg/dL at Month 6 vs detemir and NPH patients (Table). Patients on glargine had a lower frequency of total, severe and mild–moderate hypoglycaemia vs NPH patients at Month 6 (Table). 72% of Drs and 78% of patients rated insulin treatment as good/very good. More Drs (76%) and patients (81%) rated glargine as good/very good vs other insulins (% of Drs and patients): NPH 58 and 68%; detemir 43 and 51%; significant (p<0.0001) differences were seen for both Drs and patients between insulin type.

Conclusion: Starting insulin treatment with basal insulin was efficient and safe in Asian T2D patients, with significant differences found among basal insulins. As this was a descriptive registry, no sample size calculation was used, leading to large variations in patient No. between groups. Thus, these results should be interpreted with caution.

	Glargine n=2016	NPH n=589	Detemir n=61	All N=2679	p (insulin types)
Mean HbA_{1c}, %					
Baseline	9.7*	10.1	10.2	9.8	<0.0001
Change (unadjusted)	–2.1†	–2.1‡	–1.1	–2.1	<0.0011
Change (adjusted)	–2.2*†	–1.9‡	–0.8	–	<0.0001
HbA_{1c}<7% at Month 6, %	35.2*†	30.7‡	9.8	33.7	<0.0001
Mean FBG, mg/dL					
Baseline	208§	216	227	210	0.0043
Change (adjusted)	–84*†	–75‡	–51	–81 (unadjusted)	<0.0001
FBG<110mg/dL at Month 6, %	39.5*¶	29.7	23.0	36.9	<0.0001
Weight, kg					
Baseline	69*	65	68	68	<0.0001
Change (unadjusted)	+0.02	+0.21	+0.01	+0.06	0.2444
Change (adjusted)	+0.04	+0.13	+0.01	–	0.7157
Insulin dose, U (U/kg)					
Baseline	13.4	10.9	15.6	12.9	–
Month 6	15.4	15.5	17.9	15.4	–
Change	+2.0§	+4.5§	+2.1‖	+2.5	–
Hypoglycaemia at Month 6, events/patient/yr					
Total	0.229#	0.472	0.361	0.0287	<0.0001
Severe	0.003#	0.031	0	0.009	<0.0001
Mild–moderate	0.224#	0.458	0.361	0.280	<0.0001

*p<0.001 glargine vs NPH;†p<0.001 glargine vs detemir;‡p<0.001 NPH vs detemir;¶p<0.01 glargine vs detemir;§p<0.001 change from baseline;‖p<0.05 change from baseline;#p<0.05 glargine vs NPH;All other pairwise comparisons were not significant

Conflict of interest:
Advisory board: Shih-Tzer Tsai: sanofi-aventis, Takeda, Eli Lilly
Other substantive relationships: Shih-Tzer Tsai: Speakers Bureau. sanofi-aventis, GSK, MSD, Novo Nordisk, AstraZeneca, Servier. This study was supported by sanofi-aventis.

P-1452

Insulin pump therapy for children/young people: Impact on condition management in the context of family lives

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Background: It has been estimated that around 10%-25% of type 1 diabetes mellitus (T1DM) patients are treated with insulin pumps or continuous subcutaneous insulin infusion (CSII) in the US and other European countries. However, this percentage is much lower in the UK (1%), with only 0.1% of children with T1DM treated with CSII.

In the UK, recent government policy has emphasized that disease management for children should allow them, and their families, to lead normal lives. To date, there is limited evidence from the users' perspective that demonstrates the benefits and problems of insulin pumps in the lives of children and their parents. Such evidence will inform policy regarding recommendations for CSII use in children and young people.

Aim: To examine the experiences of children using CSII, and their parents, including glycemic control, use of pump technology and flexibility in lifestyle for children of different ages and durations of pump therapy.

Methods: The study was conducted in the Paediatric Diabetes Clinic at University College Hospital (UCH), London. All patients (N= 70) using insulin pumps and attending the clinic, and their parents, were invited to participate. Semi-structured audio-recorded interviews were conducted with parents of all children and children aged 5 years and older. Measures of HbA1c values from six months prior to, and after, pump therapy were also obtained from medical records. Quantitative analysis of structured data was undertaken using SPSS. Qualitative data were analyzed by an iterative process employing a constant comparative approach.

Results: Both the parents and the children found it easier to maintain glycemic control within their target range with CSII compared to injection therapy. This was supported by HbA1c measures and reported severity of hypoglycaemic episodes. Whilst patients and the parents generally found the device itself easy to use and more acceptable than injection from the start, variable lengths of time were required to develop confidence in carb-counting and dose calculation. Parents and children reported an overall increase in flexibility in lifestyle and their ability to participate in daily activities. Trends in the independent use of insulin pumps were associated with both children's age and duration of pump use.

Conclusion: Parents and children using CSII found it easier to lead normal lives by being able to maintain glycemic control and accommodate more flexibility in lifestyle, which is a central goal of health policy for children in the UK. This evidence will inform future policy regarding recommendation for CSII use for children with T1DM.

No conflict of interest

P-1453

Guiding the optimal use of insulin analogues

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Aims: The Canadian Agency for Drugs and Technologies in Health (CADTH) through its Canadian Optimal Medication Prescribing and Utilization Service (COMPUS) produced a series of Optimal Therapy Reports and related intervention tools aimed at optimizing the use of insulin analogues in Canada. Given the high prevalence and rising incidence of diabetes in Canada, the optimal prescribing and use of insulin and insulin analogues has the potential to positively impact health outcomes for a large number of patients. Given the increasing number of people diagnosed with diabetes mellitus each year, health care providers, consumers, and policy makers require evidence-based information on the optimal use of these agents.

Methods: Research efforts for the comparison of insulin analogues with conventional insulins focused on:

- clinical evaluation (systematic reviews and meta-analyses)
- economic evaluation (cost-effectiveness analyses)
- current utilization analysis
- current practice analysis
- identification of practice and knowledge gaps
- barriers to optimal use
- creation of key messages
- development of intervention tools

Results:

- 16 optimal therapy recommendations were produced
- Three gaps in knowledge and practice were revealed through comparing information from the Optimal Therapy Reports: Current Utilization of Insulin Products in Canada, and Current Practice Analysis with the Optimal Therapy Recommendations for the Prescribing and Use of Insulin Analogues
- Key messages were developed based on the gaps and recommendations
- COMPUS developed several intervention tools that will encourage the evidence-based optimal prescribing and use of insulin analogues

Discussion/conclusion: Uptake of COMPUS key messages on the optimal use of insulin analogues has the potential to positively impact health outcomes for a large number of patients and to provide evidence for decision-makers toward the efficient use of finite health care resources. This presentation will discuss the COMPUS process from clinical and cost-effectiveness evidence to the production of intervention tools designed to improve the prescribing and use of insulin analogues. Key messages on bolus insulin and basal insulin therapy will be highlighted.

No conflict of interest

P-1454

Long term evaluation of a programme of intensive treatment with continuous subcutaneous insulin infusion (CSII) in patients with type 1 diabetes

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Introduction: CSII therapy is an effective treatment to ameliorate metabolic control and quality of life in patients with type 1 diabetes. Nevertheless most of the studies have evaluated only short term results.

Objective: To evaluate the long term results (three years) of CSII treatment in type 1 diabetes.

Material and methods: This is an observational longitudinal study in patients previously treated with multidose of insulin (MDI) who start and continue during at least three years insulin pump therapy. We ruled out pregnant or pregestational patients (32 women) and patients using combined sensor-pumps systems (34 patients). We analyzed in 49 patients the following data: age, sex, duration of the disease, macro and microvascular complications, and reason for starting CSII treatment. Initially and every six months periods during three years were evaluated: dose of insulin, weight, number of self monitoring blood glucose (SMBG), HbA1c, hypoglycemic events, quality of life (DQOL), and medical visits frequency.

Results: We obtained data from 49 patients (26 male and 23 female), with a median age of 34,11+/-11,7 years and 17,59± 7,41 years of diabetes duration. 11,6% had neuropathy, 12,2% nephropathy (4,1% with chronic kidney failure) and 28% retinopathy. The clinical reasons to initiate CSII treatment were: 37,5% bad metabolic control, 40,6% glycemic lability and 21,9% severe or frequent hypoglycemic events. During three years, six patients dropped out of CSII treatment and four pumps were removed by the medical team.

	Basal	6 months	12 months	24 months	36 months
HbA1c	8.11±2,2	7.6±1,3*	7,8±0.9*	7,2±2,6*	8,2 ±0.97
Insulin units /Kg	0,67 ±0,4	0,49±0,29	0,5±0.4	0,48±0,3	0,42±0,32
Weight	69±10,6	69,4±10,7	70,4±10.6*	71,6±11.2*	73,9±11,8*
Severe hypoglycemic events /year	0,43	0.06	0	0	0.03
Number of hypoglycemia events /week	4,5±3	3,3±2,8	2,1±1,7*	2,8±2,2*	2,7±1,6
Ketoacidosis (requiring hospital admission)	0	0	0	0	0
Sensibility factor	37,6 ±17.8	45,3±19.04	40.7±18.9	38,8±18,4	41,3±10,3
Carbohydrate rate	1.05±0,5	0,88±0,44	0.95±0.46	0.97±0,44	1,03±0,29
SMBG	3,6±2.5	3,1±1,99	3,8±1,9	3,7±2,2	3,2±1,4
Number of visits / month		0,62±0,22	0,28±0,14	0,30±0,11	0,30±0,11
DQOL	92± 16,15	80,82± 19,2*	82,12±19,1*	82,5±14,0*	

*P<0,05

Conclusions: CSII treatment improves metabolic control and quality of life in well selected patients. This improvement is evident in the first six months and is mantained during all this period for quality of life but not for HbA1c reduction.

No conflict of interest

P-1455

The effect of various insulin regimens on glycemic control and cost-effectiveness

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Background and aims: We aimed to compare the efficacy of various insulin regimens on glycemic control in diabetic patients using insulin.

Materials and methods: Data of 987 patients (583 female/404 male) were analysed retrospectively. Patients were divided into groups according to insulin regimens as insulin lispro 25 (Lis25), human insulin 30 (HM30) and biphasic insulin aspart 30 (BiAsp30) for twice daily insulin regimens and human regular insulin and neutral protamine insulin Hagedorn [NPH] (HR-HN), insulin lispro and glargine (LisGlar), insulin aspart and glargine (AspGlar) and regular human insulin and glargine (HR-Glar) for intensive regimens. Type of insulin, insulin doses, total and per kilogram body weight, HbA1c levels before and after treatment, body weight, duration of diabetes, duration and onset of insulin therapy were evaluated and compared among groups.

Results: In twice daily insulin regimens glycemic control was achieved in all types of insulin in similar success rates. Glycemic regulation rates were 32,4 %, 44,6 % and 40,4 % in Lis25, HM30 and BiAsp30 groups, respectively, when target HbA1c was defined as <7. Lowest insulin doses per kilogram were used HM30 group compared to Lis25 and BiAsp30 groups (0,37± 0,15 IU/ kg vs 0,49± 2,27 and 1,03± 5,28 IU/ kg, respectively). In intensive insulin regimens, achievements of glycemic control rates were 39,7 %, 17,9 %, 23,7 % and 30 % in HR-HN, LisGlar, HR-Glar and AspGlar groups, respectively. Insulin doses per kilogram used in intensive regimens were 0,55± 0,17; 0,52± 0,14; 0,61± 0,25 and 0,55± 0,26 IU/kg, in HR-HN, LisGlar, AspGlar and HR-Glar, respectively.

Conclusion: Although glycemic control was achieved to some degree with all regimens, HR-HN was effective in smaller doses and cheaper compared to AspGlar. Also in twice daily regimens, all groups were similarly successful in achieving glycemic control, but HM30 was effective in smaller doses and cheaper than Lis25 and BiAsp30 groups. Our data indicate that regimens using human insulin are cost-effective and as successful as insulin analogues.

No conflict of interest

P-1456

A user study assessing the performance of a new reusable insulin pen injection device compared with other injection pens available on the market

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Aims: Important practical aspects of insulin injection pen devices for patients with diabetes mellitus (DM) are ease of use and performance. ClikSTAR® (sanofi-aventis) is a new reusable insulin pen device under development for injection of insulin glargine or insulin glulisine.

Methods: In this user study, ease of use and performance of ClikSTAR was compared with 3 available reusable insulin pens: NovoPen 3®, NovoPen 4® (Novo Nordisk) and Lilly Luxura® (Eli Lilly). 654 patients with DM from the US, Canada, UK, France and Germany were included in the study (Oct–Dec 2008). For each pen type, the patient was assessed via a face-to-face questionnaire on the following: fixing/replacing cartridge, hearing/feeling clicks, safety test and dialling/delivering 40 U dose; patients then rated overall usability.

Results: Overall, a higher proportion of patients found ClikSTAR easy to use vs comparator pens (Table 1). For specific categories assessing ease of use, such as replacing cartridge, dialling a dose and feeling the clicks, a significantly higher proportion of patients rated ClikSTAR easy to use vs other pens. Patients using ClikSTAR did not experience any significant difficulties in completing tasks vs other pens (Table 2). The proportion of patients not requiring help completing specific tasks with ClikSTAR was higher or similar vs comparator pens; significantly more patients completed all steps without help vs NovoPen 3 and 4 pens.

Conclusion: At the final stages of ClikSTAR pen development, in patients with DM, ease of use and overall performance of the pen was equal to or better vs other injection pens currently available on the market.

Table 1

	Lilly Luxura	NovoPen 3	NovoPen 4	ClikSTAR
Overall score, %				
Ease of use*	79	50	83	86
Ease in completing task (scale of 1–7; 1=not at all easy and 7=extremely easy)				
Ease of use	5.7†	4.5	5.7†	6.1‡
Cartridge replacement	6.0†	4.6	5.9†	6.2‡
Hearing/feeling clicks	6.0†/5.5	5.7/5.5	6.0†/5.8§	6.1†/5.9‡
Overall rating	3.4†	2.6	3.6§	3.7§
Difficulty completing task (scale of 1–5; 1=no difficulty and 5=got stuck)				
Dialling 40 U	1.1	1.3‖	1.3‖	1.1
Delivering 40 U	1.2¶	1.2¶	1.1	1.1
Fixing cartridge	1.2	1.6‡	1.4‖	1.2
Safety test/priming	1.2	1.3‖	1.3‖	1.2

Table 2

	Lilly Luxura	NovoPen 3	NovoPen 4	ClikSTAR
% Patients NOT requiring help				
Dialling 40 U	95	92	91	96
Dialling mechanism scored 'just right'*	49	52	57	63
Delivering 40 U	94	95	97	96
Fixing cartridge	92	82	89	92
Safety test/priming	89	85	84	89
Requiring no help at any step (including safety step)	74†	62	65	75**

*% Patients rating pens as good/very good/excellent; †p=0.05 vs NovoPen 3; ‡p=0.05 vs all pens; §p=0.05 vs NovoPen 3 and Lilly Luxura; ‖p=0.05 vs ClikSTAR and Lilly Luxura; ¶p=0.05 vs ClikSTAR and NovoPen 4; **p=0.05 vs NovoPen 3 and 4

Conflict of interest:

Paid lecturing: Alfred Penfornis: sanofi-ventis, Novartis, MSD
Advisory board: Alfred Penfornis: sanofi-aventis, Novo-Nordisk, Novartis, BMS, Astra-Zeneca
Commercially-sponsored research: Alfred Penfornis: sanofi-aventis

P-1457

Safety and efficacy of insulin detemir in patients with type 1 or type 2 diabetes: data from the PREDICTIVE study in a Korean population

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Aims: To evaluate clinical safety and efficacy of insulin detemir in Korean patients with type 1 or type 2 diabetes mellitus under normal clinical practice conditions.

Methods: PREDICTIVE™ is an observational, multi-centre, open-label, prospective study to assess the safety and efficacy while using insulin detemir once or twice daily. The results of the 26-week treatment in Korean patients with type 1 or type 2 diabetes are presented, based on an interim analysis of 2005 patients from an expected population of 10,000 patients at completion of the study.

Results: Baseline characteristics: Mean age: 56.0 ± 12.8 years, mean diabetes duration: 9.6 ± 6.1 years, mean HbA_{1c}: 9.2 ± 1.8%, mean fasting plasma glucose (FPG) 10.64 ± 4.12 mmol/L, mean body weight: 63.5 ± 10.6kg. The majority of patients included had type 2 diabetes (97.4%). During the study, the incidence of serious adverse drug reactions (SADRs) including major hypoglycaemic episodes (adverse events considered related to treatment) was 0.3% (six subjects). The incidence of all hypoglycaemic episodes decreased from 4.51 episodes per patient year at baseline to 1.71 episodes per patient year after 26 weeks. The incidence decreased both for diurnal and nocturnal episodes. A corresponding decrease was found for the incidence of major hypoglycaemic episodes from 0.64 per patient year at baseline to 0.01 per patient year at 26 weeks. Fourteen adverse events (AEs) were reported in nine patients and 10 serious AEs were reported in seven patients. Most AEs (92.9%) were classified as 'unlikely' related to insulin detemir treatment. Treatment with insulin detemir was associated with a significant reduction in HbA_{1c} of -0.9% ± 1.8% from baseline to 26 weeks ($p<0.0001$). Insulin detemir also significantly improved FPG (change from baseline to 26 weeks: -2.68 ± 4.21 mmol/L, $p<0.0001$). No difference was observed in body weight from baseline to end of the study (baseline vs. 26 week: 95% CI = [-0.1, 0.1], $p > 0.05$).

Conclusion: In Korean patients with type 1 or type 2 diabetes, treatment with insulin detemir was associated with

- a low incidence of serious adverse events and lowering of hypoglycaemia
- improved glycaemic control and non-significant weight change.

No conflict of interest

P-1458

Improved glycaemic control in Korean patients with type 2 diabetes after transfer to insulin detemir: data from the PREDICTIVE study in a Korean population

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Aims: To evaluate clinical safety and efficacy of insulin detemir in Korean patients with type 2 diabetes mellitus that transferred to insulin detemir from other basal insulin or oral antidiabetic drug (OAD).
Methods: PREDICTIVE™ is an observational, multi-centre, open-label, prospective study to assess the efficacy and safety while using insulin detemir once or twice daily. Results from 26 week of treatment are presented from an interim analysis of 1672 Korean patients with type 2 diabetes mellitus classified based on previously treated by insulin glargine, neutral protamine Hagedorn (NPH) insulin or OAD only, respectively. This expected study population at completion of the study is 10,000 patients..
Results: Overall, 461 patients previously treated with glargine, 260 patients previously treated with NPH and 951 patients previously treated with OAD only were enrolled in this analysis. Twenty six weeks after transfer to insulin detemir, only a few serious adverse events were reported in the three subgroups (0.9% in glargine group, 0% in NPH group and 0.3% in OAD only group). During the study period, one serious adverse drug reaction including major hypoglycaemic episode was reported in the glargine subgroup and none in the other two subgroups. The proportion of total hypoglycaemic episodes decreased in both groups pretreated with basal insulin (glargine group: from 13.9% at baseline to 6.9% at 26 weeks; NPH group: from 21.2% at baseline to 9.6% at 26 weeks), but increased slightly in OAD only group (from 1.2% at baseline to 5.3% at 26 weeks). No difference was observed in change of body weight from baseline to end of the study in any of these groups. Treatment with insulin detemir was associated with a significant reduction in HbA_{1c} in all three groups (changes from baseline to 26 weeks: -0.3 ± 1.6% in glargine group; -1.0 ± 1.5% in NPH group; -1.1 ± 1.7% in OAD only group; p< 0.05 in all analyses). Insulin detemir also improved fasting plasma glucose (changes from baseline to 26 weeks: -0.13 ± 0.77 mmol/L in glargine group (not significant); -0.79 ± 2.03 mmol/L,in NPH group, p< 0.05; -0.49 ± 0.88 mmol/L in OAD only group, p<0.05).
Conclusion: In Korean patients with type 2 diabetes with poor glycaemic control by other basal insulin (insulin glargine or NPH) or OAD only, insulin detemir improved glycaemic control with less risk of hypoglycaemia. The results show how insulin detemir is efficacious and well tolerated in Korean patients with type 2 diabetes.

No conflict of interest

P-1459

Evaluation of daily glucose variation using CGMS in CSII and MDI treated patients with long-standing diabetes mellitus type 1

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Aim: To evaluate with Continuous Glucose Monitoring System (CGMS) glucose variability, events of hypoglycemia and daily glycaemic control in patients with long-standing Diabetes Mellitus type 1 (DMT1) treated with either Continuous Subcutaneous Insulin Infusion (CSII) using insulin aspart or Multiple Daily Insulin injection (MDI) using glargine once daily and regular three times daily.
Patients and methods: Twenty eight patients with DMT1 (9 women) with mean age 36.7 ± 10.2 years and mean duration of DM 20.3 ± 7.6 years were on treatment with either CSII (n=11) or MDI (n=17). All patients wore a CGMS sensor for six days and hyper / hypoglycaemic episodes and glycaemic control were evaluated.
Results: There were more hypoglycaemic excursions [blood glucose (BG) <or= 60 mg/dl] 4.8±1.0 vs 1.4±1.1, p=0.018 and the average duration of hypoglycaemia was significantly different (8.9 ±2.6 vs 2.4 ±1.7, p=0.048) in MDI than CSII group. Number of measurements within the glucose range of 60-70 mg/dl were not significantly different (90.3 ± 19.9 vs 40.8 ±31.3, p=0.067) for the two groups. Hyperglycaemic excursions (BG >or= 180 mg/dl), glycaemic exposure over 150 mg/dl and maintenance of near-euglycaemia as determined by the average amount of time spent within the glucose range of 80-140 mg/dl were similar between the two groups. HbA1c was significantly better (6.8 ± 0.4% vs 8.2 ± 0.4 % p=0.019) in CSII than in MDI group. Mean age and mean duration of DM did not differ between the two groups.
Conclusion: In present study patients with long-standing DMT1 treated with CSII had fewer hypoglycaemic excursions as evaluated using CGMS and significantly better HbA1c than patients treated with MDI.

No conflict of interest

P-1460

Does insulin glargine treatment affect reduction of CRP in obese patients with type 2 diabetes?

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Aim: To examine whether the use of insulin glargine alone or in combination with metformin has influence on the reduction of CRP in obese type 2 diabetic patients (T2D). In this 12-months randomized clinical trial, we assessed the comparative effects of metformin and insulin glargine alone or in combination on inflammatory biomarkers, glycemic control, and lipids.
Methods: In beginning of study excluded patients who had coronary heart, kidney disease before, diabetes mellitus type 1 or any inflammatory response before. In study included 83 obese with T2D [43 male and 40 female, BMI = 28.93 ± 2.45 kg/m2, aged 33-65 yr], who had previously been treated with sulfonylurea therapy and who have poor glycemic control (HbA1c>7%) and elevated CRP (>2mg/l). Patients divided in three groups with similar BMI, age and sex. Fifteen patients received glargine s.c. alone once a day (1st group), 38 patients received glargine s.c. in combination with metformin orally at the doses of 3x850 mg/d (2nd group) and 30 patients received metformin alone at the doses of 3x850 mg/d (3rd group). All patients will receive diet and exercise counseling. Markers of glycemic control and inflammation including fasting blood glucose (FBG), postprandial blood glucose (PBG), HbA1c, hsCRP, lipids, basal insulin and C-peptide, were measured at baseline, 3, 6, 9 and 12 months. Clinically, levels of CRP>3 mg/l indicate elevated risk for myocardial infarction and stroke. Percentile, average and correlation analysis have been utilized in statistical analysis.
Results: HbA1c, FBG and PBG were significantly reduced from baseline 3 months after starting treatment in each of the groups (p<0.01), but the best glucose control had 2nd group. Listed reduction was maintained in a similar proportion during the 12 months. HbA1c decreased from 8.98 to 7% in 3rd group, to 6.5% in 2nd group and to 6.79% in 1st group (NS, p=0.31). FBG decreased for 5.2 mmol/l in 1st group, for 6.5 mmol/l in 2nd group and for 4.9 mmol/l in 3rd group. Mean body weight and mean waist circumference significantly reduced in the 3rd group (p<0.05). Mean serum CRP levels (4.38 ± 1.95 mg/l) significantly decreased after metformin treatment (-1.98mg/l, p<0.05) and glargine+metformin treatment (-1.67mg/l, p<0.05) but after glargine treatment CRP decreased not significantly (-0.89mg/l). Level of CRP significantly correlated to level of fasting insulin, C-peptide, to BMI, HbA1c, total cholesterol, and to triglycerides. Total cholesterol and low-density lipoprotein cholesterol levels decreased as well in all three groups.
Conclusion: Reduction levels of CRP in obese patients with type 2 diabetes were more effective after glargine treatment in combination with metformin than after glargine treatment alone.

No conflict of interest

P-1461

Patterns of cardiovascular risk and disease amongst people with Type 2 diabetes starting insulin: baseline characteristics in the CREDIT study

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Aims: Insulin therapy improves long-term glycaemic control, which can reduce the risk of vascular events associated with Type 2 diabetes mellitus (T2DM).
Methods: The Cardiovascular Risk Evaluation in people with T2D on Insulin Therapy (CREDIT) study is a 4-yr, 314 centre, non-interventional trial in North America, Europe and Asia, which includes people with T2DM who had recently started insulin therapy.
Results: At baseline, 3031 patients with T2DM were enrolled (51% male; mean±SD age 61±10 yr; BMI 29.3±6.3 kg/m^2; T2DM duration 11±8 yr). Macrovascular disease was present in 34%; most commonly stable angina (13%), peripheral vascular disease (11%) and prior myocardial infarction (10%). Unsurprisingly, there was a trend for more CV risk factors amongst people with T2D who had at least one cardiovascular disease (CVD) condition, including older age (>=63 yr), male sex, diagnosis of hypertension, family history of CVD and physical inactivity.
Conclusion: Shifting the management paradigm to attempt to prevent rather than retrospectively treat CVD through tight metabolic control is a high priority of diabetes care. As the study progresses, analysis of CVD outcomes stratified by metabolic control on insulin initiation should provide evidence as to the value of timely initiation of insulin to achieve this treatment goal.

	CVD conditions (n)			p
	None n=1993	1 n=502	>1 n=527	
Age (yr)	60±10	63±9	65±9	<0.001*
Male (%)	49	46	62	<0.001†
Diagnosed hypertension (%)	63	78	84	<0.001†
Family history of premature CVD (%)	22	29	38	<0.001†
Physical inactivity (%)	52	51	58	0.033†
Smoker (%)				
Never	57	60	46	<0.001†
Stopped ≥1 yr	23	24	38	
Stopped <1 yr	4	4	4	
Current	17	12	13	
BMI (kg/m^2)	29.2±6.4	29.5±6.4	29.6±5.6	0.357*
HbA_{1c} (%)	9.6±2.0	9.5±1.9	9.3±1.8	0.029*
HbA_{1c} ≤8.5% (%)	34	35	39	0.083†
Lipids (mmol/l)				
Total cholesterol	5.2±1.4	5.3±1.5	5.0±1.4	0.001*
LDL cholesterol	3.0±0.9	2.8±1.0	2.7±0.9	0.002*
HDL cholesterol Male	1.2±0.4	1.2±0.3	1.1±0.3	<0.001*
Female	1.4±0.4	1.4±0.5	1.3±0.4	0.041*
Triglycerides	2.0±2.0	2.5±3.7	2.3±2.0	<0.001‡

Data are mean±SD or %. p value denotes relationship between risk factor and trend in CVD condition; *ANOVA; †Chi square; ‡Kruskal-Wallis

Conflict of interest:
Advisory board: M. Marre: Novo Nordisk, MSD, Servier, sanofi-aventis G. Vespasiani: Novo Nordisk, sanofi-aventis, Roche Diagnostics
Employee: K. Admane: sanofi-aventis
Commercially-sponsored research: L. Blonde: Amylin Pharmaceuticals, AstraZeneca, Boehringer-Ingelheim Pharmaceutical, Bristol-Myers Squibb, Eli Lilly and Company, MannKind Corporation, Merck & Co., Inc., Novo Nordisk, Novartis Corporation, Pfizer Inc. and sanofi aventis
Other substantive relationships: This study is sponsored by sanofi-aventis. P. Home and institutions with which he is associated receive funding for research, lecturing and health-care development activities from all major pharmaceutical companies active in diabetes, including sanofi-aventis. L. Blonde has received honoraria from Abbott, Amylin Pharmaceuticals, AstraZeneca, Bristol-Myers Squibb, Daiichi Sankyo, Eli Lilly and Company, GlaxoSmithKline, LifeScan, Merck & Co., Inc., Novartis Corporation, Novo Nordisk, Pfizer Inc. and sanofi aventis for acting as a speaker and consultant, and from Boehringer-Ingelheim Pharmaceutical and Hazlozyme for acting as a consultant.

P-1462

Management of in-patient hyperglycemia: safety of intensive intravenous insulin aspart

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Aims: Several studies have shown that hypoglycemia is the most common safety concern with intravenous insulin. However such clinical safety data is minimal for intravenous (IV) use of insulin aspart (IAsp). The aim of this study (ClinicalTrials.gov Id: NCT00700648) was to evaluate the safety and effectiveness of using IV IAsp in the management of in-patient hyperglycemia.
Methods: This is an open label, non-randomized, non-interventional, observational study. IV IAsp was prescribed for managing hyperglycemia among hospitalized subjects, according to routine clinical practice in India. In total 2972 (Male: 62.9%, Female: 37.1%) subjects received IV IAsp during the study period of six months. Two thousand subjects (67.3%) were admitted to ICU and the rest received IV IAsp in non-ICU setting.
Results: Fifty four episodes of major hypoglycemia were reported in 50 subjects: 1/2/3 episodes in 47/2/1 subjects respectively and 162 minor hypoglycemic episodes were reported in 131 subjects: 1/2/3/4/6 episodes in 109/16/4/1/1 subjects respectively. Overall only 1.6% of the subjects experienced at least one episode of major hypoglycemia with IV IAsp (see Table 1). There were no hypoglycemia related complications. There were five serious adverse events (SAEs), unlikely to be related to the study medication, reported during the study.
Conclusions: Intravenous insulin aspart appears to be a safe and well tolerated option for managing in-patient hyperglycemia in ICU as well as non-ICU settings.

Table: Incidence of hypoglycemia during IV IAsp treatment

	Subjects experiencing at least one episode of hypoglycemia		
	ICU (n=2000)	Non-ICU (n=972)	Overall (n=2972)
Major hypoglycemia #, n (%)	37 (1.8%)	13 (1.3%)	50 (1.6%)
Minor hypoglycemia, n (%)	65 (3.2%)	66 (6.7%)	131 (4.4%)
Overall *, n (%)	99 (4.9%)	79 (8.1%)	178 (5.9%)

receiving i) IV dextrose / glucagon and / or ii) blood glucose < 3.6 mmol/L
* Three subjects in ICU group and one subject in Non-ICU group experienced both major & minor hypoglycemia.

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P-1463

Insulin therapy: partial knowledge by part of diabetic patients interferes in their adherence to the treatment

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Aims: The aim of this study was to correlate the insulin therapy knowledge of people who have Diabetes Melllitus (DM) and the adherence level of the same individuals to the therapeutics schemes.
Methods: The research was based on semi-structured questionnaire answered by 30 type 1 diabetic individuals. All of them are over 16 years old and attend a regular health education program which deals with DM, health education and

oriented physical activities. Data regarding knowledge, trust and understanding of their treatment was collected as well as their level of adherence, awareness and commitment. It was studied 15 women and 15 men, with the average age of 30 ± 12 and the average time of DM equivalent to 11 ± 8 years. In addition, the average insulin applied daily was of 2.9 ± 1.3.

Results: It was possible to verify that, before attending the program, 53.3% of the participants affirmed their non-adherence, partially or totally, to the treatment as well as their unawareness and non-commitment to the same. This might have reflected in the 76.6% of the individuals who declared not knowing the start of action, the durability of response and the serum peak levels of insulin they used. Moreover, it is believed that it also influenced the 50% of those who declared not trusting and not understanding the treatment. Among the questions made before and after the participation in the program, the clinical question related to 'the knowledge about insulin therapy' was the one which presented the highest absolute average variation (0.97; an increase of 48%). Thus, it suggests a direct influence in the treatment adherence level after the program: 93.3% of the participants affirmed to have now an ideal level of adherence, awareness and commitment to the treatment against 46.6% of the ones who affirmed the same before attending the program.

Conclusion: Nowadays, communicable chronic diseases have been considered one of the main causes of morbidity in population and Diabetes Mellitus is one of them. It is noticeable the existence of individual and contextual factors which may influence the treatment adherence and are essential for the efficacy of pharmacotherapy in diabetic patients. Moreover, it is indispensable that the diabetics have this capacity for managing the insulin schemes by themselves when it is necessary. For doing so, however, it is necessary that the patient understands the treatment and trusts in it, which will directly affect in the treatment adherence.

No conflict of interest

P-1464

Characteristics predicting poor blood glucose control at the time of starting insulin therapy; data from the CREDIT study

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Aims: The Cardiovascular Risk Evaluation in people with Type 2 diabetes mellitus (T2DM) on Insulin Therapy (CREDIT) study is assessing the effect of insulin on the risk of vascular events.

Methods: CREDIT is a 4-yr, 314 centre, non-interventional trial in North America, Europe and Asia and includes 3031 people with T2DM who have recently started insulin. This analysis aimed to identify factors leading to poor glycaemic control (HbA_{1c} >8.5 %) at the time of starting insulin. Participants were divided into two groups by HbA_{1c} (≤8.5 and >8.5 %) and the baseline characteristics of the groups were compared using Chi square or Wilcoxon rank-sum test. For factors associated with poor glycaemic control, multivariable backward logistic regression analysis was performed, entering all variables with p<0.20 on univariate analysis.

Results: Table 1 presents the baseline characteristics according to HbA_{1c} group. Age, BMI, region, FBG and the diagnosis of retinopathy, peripheral neuropathy and hypertension were identified as potential predictors of poor glycaemic control. Variables remaining in the model with a p value <0.05, and therefore taken as significant predictors of poor glycaemic control, were age (p=0.003), FBG (p=0.000) and region (p=0.000) (Table 2).

Conclusion: Based on the modelling of HbA_{1c} levels of ≤8.5 and >8.5%, at the time of starting insulin, older people appear to have better glucose control (lower HbA_{1c} [≤8.5%]) compared with younger people. Not surprisingly, high FBG was also correlated to high HbA_{1c} levels. There are also unexplained geographical differences in attitudes to starting insulin.

Table 1: Factors associated with poor glycaemic control at the time of starting insulin on univariate analysis

Potential factor	HbA_{1c}			p
	≤8.5% n=1025	>8.5% n=1928	All n=2953	
Age (yr)	63.1 (10.3)	60.5 (10.1)	61.4 (10.2)	<0.001*
Male (%)	53.1	49.6	50.8	0.075†
BMI (kg/m²)	29.7 (6.2)	29.1 (6.3)	29.3 (6.3)	0.013*
Region (%)				
North America	12.0	6.4	8.3	
Eastern Europe	18.7	27.6	24.6	
Southern Europe	23.0	19.9	21.0	<0.001†
Northern Europe	21.3	11.8	15.1	
France	15.7	13.0	14.0	
Japan	9.3	21.3	17.1	
Retinopathy (%)	27.7	35.3	32.7	<0.001†
Peripheral neuropathy (%)	32.8	41.4	38.5	<0.001†
Foot ulcer (%)	3.4	2.5	2.9	0.174†
Macrovascular disease (% ≥1 event)	36.1	32.9	34.0	0.077†
Smoker or recent ex-smoker (%)	17.2	19.7	18.9	0.098†
Diagnosed hypertension (%)	71.3	67.8	69.0	0.047†
FBG (mmol/l)	4.5 (1.3)	5.9 (1.7)	5.4 (1.7)	<0.001*

Mean (SD) or percent. *Wilcoxon; †Chi square

*Table 2: Factors associated with poor glycaemic control (HbA_{1c} >8.5%) at the time of starting insulin - multiple logistic regression analysis**

Factor	OR (95% CI)†	p
Age	0.86 (0.78, 0.95)	0.003
FBG	1.33 (1.29, 1.38)	0.000
Region‡		
Eastern Europe vs France	1.44 (1.06, 1.96)	0.021
Japan vs France	3.43 (2.24, 5.23)	0.000
North America vs France	0.60 (0.40, 0.89)	0.011
Northern Europe vs France	0.42 (0.29, 0.62)	0.000
Southern Europe vs France	0.89 (0.65, 1.22)	0.460

*Model based on 2276 observations; †OR based on clinically significant changes (increase in age of 10 yr, FBG 1.0mmol/l); ‡Overall p=0.000

Conflict of interest:
Advisory board: M. Marre: Novo Nordisk, MSD, Servier, sanofi-aventis G. Vespasiani: Novo Nordisk, sanofi-aventis, Roche Diagnostics.
Employee: K. Admane: sanofi-aventis.
Commercially-sponsored research: L. Blonde: Amylin Pharmaceuticals, AstraZeneca, Boehringer-Ingelheim Pharmaceutical, Bristol-Myers Squibb, Eli Lilly and Company, MannKind Corporation, Merck & Co., Inc., Novo Nordisk, Novartis Corporation, Pfizer Inc. and sanofi aventis.
Other substantive relationships: This study is sponsored by sanofi-aventis P. Home and institutions with which he is associated receive funding for research, lecturing and health-care development activities from all major pharmaceutical companies active in diabetes, including sanofi-aventis L. Blonde has received honoraria from Abbott, Amylin Pharmaceuticals, AstraZeneca, Bristol-Myers Squibb, Daiichi Sankyo, Eli Lilly and Company, GlaxoSmithKline, LifeScan, Merck & Co., Inc., Novartis Corporation, Novo Nordisk, Pfizer Inc. and sanofi aventis for acting as a speaker and consultant, and from Boehringer-Ingelheim Pharmaceutical and Hazlozyme for acting as a consultant.

P-1465

Treatment of 212 patients with type 1 and 2 diabetes mellitus with a novel insulin preparation (AI) which is avidly absorbed if instilled into the auditory channel

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Aims: To find new routes for insulin "instillation" into the body and to abate the need for injectable insulin or oral hypoglycaemic agents, we developed a novel insulin preparation that can avidly and rapidly be absorbed from the auditory channel with the idea that small molecules in the range of 4500 Dalton are readily absorbable from mucous membranes.

Methods: Different preparations were tested in a phase Zero study for absorption. Both radioactive and bioassays were performed. At phase I, 212 patients with either type 1 (22 patients) or type 2, 190 patients were enrolled to this trial. All previous hypoglycaemic medications, including long acting insulin, were discontinued 24 hours before the study. Based on baseline BS 8-45 Unit equivalent of auditory insulin AI was instilled into the external auditory channel and the patients were let to rest. Blood sugar was tested at 15 minutes and every half hour till 3.5 hours and blood insulin levels were evaluated before and 2.5h after instillation.
Results: No patient developed local or systemic side effects. Insulin is avidly absorbed from the mucosa of the auditory channel. It does not pass the tympanic membrane evaluated with our tools. BS levels decreased substantially in 185 patients (87%) and less pronounced in another 10 (4.7%). A clear cut dose/response curve could be drawn only between 25-45IU. The response was correlated with type 1 diabetes and type 2 diabetes of shorter duration. Patients with type 2 diabetes of longer duration, history of insulin resistance, stress, anxiety during study, generalized anxiety disorder (basedon MCMI-III) and those whose external auditory channel was more grayish than red or pink fared less well than others. Almost all responding patients showed an (absolute or relative) increase of serum insulin matched with their blood sugar. Curiously, instillation of insulin into the auditory channel erased a faster response than IV insulin in 74 (35%) of the examinees. Besides, later till two months control of BS in patients who returned to their oral hypoglycaemic regimen was followed by better control giving the erroneous idea to many of our patients that this treatment might be "curable".
Discussion: This is the first trial of instillation (does not need sophisticated spraying equipments) of insulin into the auditory channel. It is extremely effective and patients respond nearly uniformly. Another trial is presented which uses a piezoelectric pump for continuous control. With clever application and larger trial of longer duration this revolutionary treatment will completely abolish sc insulin, oral hypoglycaemic agents, inhalation insulin and sophisticated therapies such as gene therapy or beta cell transplantation forever.

No conflict of interest

P-1466

Continuous control of diabetes mellitus by infusion of auditory insulin (AI) into the ear via a piezoelectric pump

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Aim: Based on previous studies we tried to design a very small and sophisticated infusion system and evaluate blood sugar control.
Methods: A piezoelectric pump of 2g weight first fed by a 70g electronic device + battery and later by a very tiny feeding electronic machine of less than 8g was used. Twenty type 2 diabetes patients were enrolled to this trial. They received a bolus of crystal insulin IV to reach a BS level of less than 150mg; afterwards, they received escalating doses of AI equivalent to1-5 IU per hour for 16h/24h or 24h/24h. The escalation was done only in case of random BS of >250mg/dl. The electronic device was self controlled and all patients received 0-10 units of insulin equivalents before each meal. Comparison with intermittent insulin, short term BS control and glycosylated albumin were goals of this trial rather than HbA_1C and long term BS.
Results: As predicted, continuous AI is followed by excellent BS control with 100% of random BS under 183mg/dl; 82% below 150 and 76% of below110mg/dl. Attacks of hypoglycaemia never happened, though rarely subjective sense of deranged well-being was encountered with normal BS; a phenomenon familiar to endocrinologists. 8 of 10 patients who were on intermittent insulin showed better control of BS with only 55-70% of the previously needed insulin. This is a great improvement as bolus insulin is the real cause of wide fluctuations of BS. Most patients enjoyed excellent BS control with 1.5-2.5IU/h in the 24h/24hregimen and 2-3.5IU/h in the 16h/24h regimen. At least 60% of the patients probably do not need insulin overnight. The glycosylated albumin showed complete normalization in 18 of 20. Patients' compliance for carrying of the piezoelectric pump with the heavier and tiny electric device was good and excellent respectively, even in patients on oral hypoglycaemic agents as they were convinced of more natural system of treatment with less strict diets.
Discussion: The result of this (not preliminary) trial is extraordinary. After decades of challenge we have developed a therapy which is extremely effective and easy to deliver. The risk of this therapy as is shown in a small number of patients is nil. Clearly, larger double blind trials with long term side effects and long term diabetes control must clarify the state of this therapy in the anti diabetic armamentarium. There were no side effects in short term and a mathematical model with a concomitant drug therapy will abolish long term local side effects (explained elsewhere). Laboratory findings have also shown that insulin does not pass the tympanic membrane and the site of absorption is the mucous membrane of the auditory channel. Continuous instillation is not faced with liquid overload relative to the auditory channel volume and does not jeopardize hearing.

No conflict of interest

Pregnancy and gestational diabetes

P-1467

Insulin therapy among women with impaired glucose tolerance of pregnancy

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Background: Women with gestational diabetes (GDM) often require insulin therapy to treat hyperglycemia. Women who have impaired glucose tolerance (IGT) of pregnancy do not fulfill diagnostic criteria for GDM and are traditionally not offered specific treatment, but may also have hyperglycemia-related adverse outcomes. However, the benefit of following these patients is uncertain, as it is unclear what proportion progress to hyperglycemia requiring insulin therapy.
Objectives: To document the proportion of women with IGT of pregnancy who progress to hyperglycemia requiring insulin therapy, and to identify predictors for insulin treatment, in women with IGT and GDM.
Methods: We reviewed the charts of 280 women with a history of IGT or GDM followed at Women's College Hospital from January 2006 to August 2008. Women were diagnosed with IGT if they did not meet criteria for GDM but had one abnormal value on a glucose tolerance test. Patients with IGT were treated according to the standard of care for women with GDM, which involves starting insulin therapy in response to hyperglycemia. We calculated the proportion of women with IGT and GDM who required insulin during their pregnancy. Using univariate and multivariable logistic regression, we also identified predictors of insulin use overall and within people with IGT.
Results: We studied 68 women with IGT (24.3%) and 212 (75.8%) women with GDM. There were no significant differences in baseline characteristics between the two groups. Insulin therapy was started in 33.8% of women with IGT, the mean gestational age at initiation was 32 weeks, and the mean maximum daily dose was 14.5 units. Women with GDM were more likely to require insulin therapy (61.8%, P<0.001), and there was a trend toward earlier treatment (30.3 weeks, p=0.057) and a higher daily dose (31.5 units, p=0.089) compared to women with IGT. On multivariable analysis, overall predictors of insulin use were PCOS (odds ratio, OR 3.36, 95% confidence interval, CI 1.26 – 8.94), family history of diabetes (OR 2.1, 95% CI 1.22 – 3.61), and obesity (OR 2.85, 95% CI 1.39 – 5.83). In the subset (n=171) with available fasting glucose levels, high serum fasting glucose (>=5.3 mmol/L) was the most important predictor of insulin need (OR 6.32, 95% CI 2.94 – 13.59).
Conclusions: Although it is not standard practice to monitor and treat women with IGT of pregnancy, we found that 34% go on to require insulin therapy to treat hyperglycemia. Our findings suggest that women with IGT of pregnancy may need similar care to those with GDM, particularly those with additional risk factors such as high fasting glucose, obesity, PCOS, and family history of DM. This study may have implications for the diagnostic criteria of GDM.

No conflict of interest

P-1468

Continuos subcutaneous insulin infusion versus multiple daily injections in pregnant women with type 1 diabetes

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Introduction: Women with type 1 diabetes who wish to became pregnant need to be intensively treated to avoid undesired effect of bad glucose control. Incidence of complications are still nowadays increased in diabetic women. Insulin pumps (CSII) offer theoretical advantages over multiple daily injections but there are few published studies comparing CSII and multiple daily insulin injections (MDI), and many of them are not recent.

Objective: To compare metabolic control and obstetric and perinatal outcome in women with type 1 diabetes treated with CSII and MDI during pregnancy.
Methods: Retrospective study, including all women treated with CSII during pregnancy in recent years (1999-2008), as compared with a control group of all women with type 1 diabetes treated with MDI in the same period of time in our Endocrinology and Pregnancy Unit. Metabolic control, obstetric and perinatal outcome were compared in both groups. In a second approach we have excluded from MDI group, younger patients and shorter duration of diabetes, obtaining a 2nd control group of MDI, with the same age and diabetes duration as CSII group.
Results: 35 pregnancies in 26 women treated with CSII and 103 pregnancies in 87 women treated with MDI were evaluated. Metabolic control (HbA1c), complications of diabetes during pregnancy (hypoglycemic events, ketoacidosis, progression of retinopathy or nephropathy) and obstetric and perinatal outcome did not differ among groups.
Conclusions: CSII during pregnancy is a safe treatment, and for selected women may be a therapeutic option in planned pregnancies. Obstetric and perinatal outcomes are similar to that achieved with MDI intensive treatment.

No conflict of interest

P-1469

Using prophylactic steroid therapy in GDM: lesson learnt

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Background: People with GDM at risk for neonatal respiratory distress syndrome are given prophylactic steroid between 28-34 weeks of pregnancy.
Aims: In this study we wanted to see the requirement/increment of the Insulin dose in GDM pregnancies given steroid.
Materials and methods: 22 GDM women given prophylactic steroid (two doses of Betamethasone 12 mg in 24 hours) over the last six months in our hospital constituted this cohort. 14 were on diet only, rest were on Insulin. Pre- and postmeal (2hr) capillary glucose were monitored (six/day) and urine was checked for ketone. Every effort was made to keep the premeal < 100mg/dl and post meal< 140mg/dl.
Results: All 14 on diet required Insulin, average short acting Insulin required was 27 units while basal 31 units/day, everybody required Insulin till delivery. The increment of people already on Insulin were 719% short acting and 838% basal Insulin. One patient required IV Insulin and none had positive urine ketone. All discharged on insulin. The average decrease in insulin dose after one week of steroid therapy was 67% of short acting insulin and 61% of basal insulin, none reached baseline dose. Only one lady on diet did not require insulin after a week of steroid therapy. On follow up, all pregnancies were uneventful and none of the babies had developed neonatal complications.
Conclusion: Management of GDM patients requiring steroid therapy is a challenge to the treating clinician. From our study, we have observed that GDM patients on diet control required average insulin of 26 and 30 units of short and long acting respectively, while already on insulin required a huge increment both in prandial and basal Insulin. A knowledge of this increment in the dosage of insulin in people with GDM receiving steroid will help in the management.

No conflict of interest

P-1470

Excess of weight and under weight in the newborn of mothers with diabetes (Study of 1,320 consecutive alive births)

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Aims: The discovery of a nexus among the weight at birth and the development of several illnesses in the mature age has opened new areas to the medical investigations.
Patients and method: We analyze retrospectively the alive born results of 1 320 children of diabetic mothers. 686 were "gestational diabetics", and 634 were "pregestational diabetics".The definition of macrosomic neonate employed was = or > to 4 000g, and for IUGR it was less than 10 percentile of the curve of weight of our institution. We used the X2 test of Fisher for the analyses of the variables and Z for the proportions with a statistical significance $p < 0,05$.
Results: We detect a frequency of macrosomic neonates of 14,2% (181/1320). The frequency of IUGR was 2,4% (32/1320). Differences were not detected on macrosomic frequency between gestational diabetics and Pregestational diabetics.
We detect among the maternal events related with macrosomic neonates: pregestational maternal weight more than 120%, the weight gain during pregnancy bigger than 15 kg, and maternal hyperglycemia. With regard to IUGR neonates, we detect among maternal events: pregestational maternal weight less than 90%, pregnancy induced hypertension and vascular lesion present at ophthalmoscopy in the Pregestational diabetics.
Conclusions: 1.- The frequency of macrosomic neonates can be expected with almost the same frequency from the period of gestational diabetes.
2.- The macrosomic and IUGR neonates of the mother with diabetes have been according with our results multifactorial events.

No conflict of interest

P-1471

An office-based "stepped-up" protocol using the PDSA Cycle for management of gestational diabetes mellitus

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Aims: Strict glucose targets are advocated in gestational diabetes mellitus (GDM) to minimize maternal-fetal complications. In a brief pilot project, we instituted a brisk "stepped-up" approach at our institution involving a multipronged strategy of education, diet, and pharmacologic therapy to achieve glucose control in GDM patients.
Methods: The "Plan-Do-Study-Act" cycle was used for quality improvement. *Plan:* A results-oriented strategy for improving GDM care. *Do:* All patients seen for GDM received preliminary in-office education followed by dietary advice within 5 days of referral from their obstetrician or primary care physician. They were supplied with blood glucose (BG) meters at the initial visit and instructed to monitor their fingerstick readings at least 4 times a day (morning fasting and one hour after each meal). Urinary ketone testing was advised. The patients were asked to use standardized blood glucose flow sheets to record and either fax or call in their BG on a daily basis. Insulin therapy, usually with multi-dose daily injections, was started within one week of the initial visit if lifestyle and diet modifications were inadequate in achieving desired glucose goals. Continued communication with phone/fax 2-3 times per week and office visits once or twice a month was continued for the remainder of the pregnancy.
Results: Over a 12-week period, 17 women with average age 28.6 years (range 19-34) were treated for GDM upon referral from the obstetrics service. The average duration of pregnancy at first visit was 28 weeks. All patients were given a "crash course" of diabetes self-management teaching, diet, with ongoing feedback and guidance. *Study:* 11 patients were managed with lifestyle/nutrition, while 6 required insulin. The average hemoglobin A1c achieved prior to delivery was 5.48% (range 4-7.3). The average fasting and 1-hour postmeal glucose were 91 and 119 mg/dl respectively. 14 of 17 pregnant women reached both the A1c and fingerstick ADA-recommended glucose goals for GDM.
Conclusion: In this pilot study applying the PDSA philosophy, glycemic control in GDM was achieved quickly and safely by employing an aggressive yet supportive approach consisting of office nurse education, self-management and dietary advice, and close, frequent, and ongoing communication between the diabetes center staff and the patient. In the final *Act* phase, further empowerment of the patient to assume and maintain responsibility will be studied. Even in practices with limited resources, GDM can be managed successfully by focusing on and emphasizing the major priorities as outlined above.

No conflict of interest

P-1472

Insulin dose, distribution & factors influencing its requirement in gestational diabetes mellitus: Indian experience

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Aim: To evaluate insulin dose, distribution and factors influencing its requirements in Gestational Diabetes Mellitus (GDM) & Decreased Gestational Glucose Tolerance (DGGT)

Material & method: 781 pregnant women with varying degree of glucose intolerance were divided in two groups GDM (as per WHO & ADA criteria) & DGGT (If any 2 hr OGTT value is ≥120mg%, but not meeting the standard ADA or WHO criteria, or if any one value is abnormal in 3hr OGTT]).They were managed till delivery by achieving euglycemia (FBG < 90 mg%, 2hr PPBG < 120 mg%) by therapeutic diet and/or Insulin therapy. Majority of subjects who required < 40IU insulin/day at delivery were evaluated for their insulin dose, relation with meal, age, pre pregnancy weight, pre pregnancy Body Mass Index (BMI), Fasting Blood Glucose and Glycosylated Haemoglobin A1c (GHb%) at diagnosis.

Observation:

- Of total 781 subjects, 382 (48.9%) women required insulin to achieve euglycemia for pregnancy. Amongst 493 GDM women 300 (60.8%) and of 288 DGGT women 82 (28.4%) needed insulin for control.
- 333 subjects (87.1%) were on < 40IU/day insulin and 49 subjects (12.8%) were on ≥ 40IU insulin/day at delivery.
- Women requiring < 40IUInsulin/24hr at delivery were further evaluated as below:
  - Insulin requirement in GDM was 16 ± 9.5 IU /day & in DGGT was 10 ± 7.2 IU/day (P 0.002)
  - There was progressive increase in insulin dose from diagnosis to delivery (P 0.01)
  - GDM women needed 0.25 IU/Kg/day & DGGT women needed 0.17 IU/Kg/day insulin of their Pre-Pregnancy weight.
  - Amongst those on three times insulin doses per day, pre dinner Insulin dose was highest & pre-breakfast was lowest in both the groups and was statistically significant [GDM – (P-0.01), DGGT-(P 0.01)]
  - Insulin dose was positively co-related to Fasting Plasma Glucose at diagnosis (P 0.01), Pre pregnancy weight (P 0.01), Pre Pregnancy BMI (P 0.01), GHb% at diagnosis (P 0.01).
  - Insulin dose could not be co-related to height & age of subject and weeks of diagnosis of pregnancy.

Conclusion: Most of the available literature indicate that insulin treatment of GDM women should be individualized. Our data has shown positive correlation of insulin dose with Fasting Plasma Glucose and Glycosylated Haemoglobin A1c at diagnosis, Pre pregnancy weight & Pre pregnancy Body Mass Index. There was progressive statistically significant increase in insulin requirement from diagnosis till delivery. Unlike others, highest dose requirement in pre-dinner period in our population indicates the probable impact of dietary habit on the insulin dose, which needs further assessment

No conflict of interest

P-1473

Lipid profile in diabetic pregnancy

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Physiologic pregnancy is associated with a broad series of metabolic adaptations which may also influence the metabolism of lipids.

Aim: To assess the modifications of cholesterol, triglycerides, low density lipid cholesterol (LDL-C) and High-Density Lipoprotein cholesterol (HDL-C) during pregnancy in diabetic women.

Materials and methods: A comprehensive lipid profile was evaluated in 30 diabetic women during physiologic pregnancy (first, second and third trimester). Conventional lipid parameters, including total cholesterol, high-density lipoprotein cholesterol and triglycerides, were evaluated. Low-density lipoprotein cholesterol was quantified by the formula of Friedewald.

Results: We observed that all the lipid parameters tested were significantly modified by the gestational age; in particular, women in the second and third trimester displayed significantly increased total cholesterol, low-density lipoprotein cholesterol, high-density lipoprotein cholesterol and triglycerides.
Advancing pregnancy was associated with an increased prevalence of undesirable or abnormal values for total cholesterol, low-density lipoprotein cholesterol and triglycerides in the second trimester (respectively 15%, 8% and 57%) and for total cholesterol, low-density lipoprotein cholesterol, triglycerides, in the third trimester (respectively 6%, 9% and 20%) compared to parameters in the first trimester of pregnancy.

Conclusion: The results of this study demonstrate that physiological pregnancy is associated with a substantial modification of the lipid metabolism from the second trimester, providing reference ranges for traditional cardiovascular risk predictors throughout the gestational diabetic period.

No conflict of interest

P-1474

Relation between glycaemic goals used in the management of gestational diabetes and perinatal outcome and the impact of maternal obesity on the rate of caesarean section

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Aims: To assess whether glycaemic goals of Preprandial Capillary Blood Glucose of <6 mmol/L and Post Prandial Capillary Blood Glucose of < 8 mmol/L used at our centre to treat patients with Gestational Diabetes are adequate in preventing perinatal complications and
To assess the impact of Maternal Obesity on the rates of Caesarean Section and Foetal Macrosomia.

Design and methods: This was a retrospective study of 92 patients with a diagnosis of Gestational Diabetes seen in the joint Antenatal-Diabetes clinic between July 2005 to May 2007 at our centre which is a secondary care 450 bedded hospital.
Data was collected on several variables and data such as rates of Caesarean section,Foetal Macrosomia, induction of labour, shoulder dystocia and still birth rate was compared against data from:

- General Maternity population data in England and Wales (from CEMACH study-Maternity Statistics England 2002- 2003) and
- Pregnancy Outcome Data of the intervention group in the ACHOIS study (Australian Carbohydrate Intolerance Study in Pregnant Women).

Results: The median BMI in our study was 27 ± 7.2. 38% of patients had a BMI of > 30 and 14% were grossly obese with a BMI greater than 40.
Total Number of Caesarean Sections were 34.7 % of which 62% were Elective and 38% were Emergency.
25% of elective Caesarean sections were done purely for Foetal Macrosomia.
The median Birth Weight observed was 3505 grams (± 551). 15.3 % of Babies were Macrosomic (birth weight > 4000grams)
5.5% of Babies were severely macrosomic (birth weight > 4500 grams).
64 % of macrosomic babies were born to mothers with a BMI of greater than 30.
There was one case of Shoulder dystocia (1.08 %) and one still birth (1.08 %) observed in this study.Still birth rate in UK is 0.57% and that of Shoulder dystocia is 3%.

Discussion: We found the rate of Caeserean Sections (34.7%) was higher than in the general maternity population but not too different from that observed in the ACHOIS intervention group (31%). The Foetal Macrosomia rate in our study (14.3%) was only slighltly higher than general maternity population in the UK (11%) and ACHOIS (10%).
In our study 38% of patients had a BMI of greater than 30 and 14% were grossly obese with a BMI greater than 40.This could be the cause of the higher caesarean delivery rates compared to the general maternity population.
Comparing the Caesarean delivery and the macrosomia rates seen in our study with that of UK general maternity population and the ACHOIS study, It can be said that glycaemic targets used at our centre which is Preprandial < 6 mmol/L and postprandial <8mmol/L are adequate to reduce the rate of perinatal complications seen in Gestational Diabetes.
Our study also signifies the link between Maternal Obesity and rates of perinatal outcomes such as C-Section and Foetal Macrosomia.

No conflict of interest

P-1475

Mother's weight history and its impact on newborn's anthopometry: preliminary data

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Introduction: Pregnancy is characterized by a physiological state of insulin resistance, which is further magnified in women affected by gestational diabetes (GDM). Low maternal birthweight is associated with a twofold higher risk for GDM, independent of major confounders. However, maternal weight history may have an impact on baby's weight.

Aim: To explore the relationships between mother's weight history and fetal and newborn's anthropometric measurements.

Methods: A 75-g OGTT was administered in 24 Caucasian women: 5 presented gestational diabetes and 19 had normal glucose tolerance. Mother's weight history was documented and body composition measures (height, weight, hip circumference, skinfold thickness) were obtained between 24 to 28th weeks of gestation, at 32 weeks of gestation and 8 weeks postpartum. Fetal measurements were obtained at 32 weeks of gestation (cranial, abdominal perimeters, femur length, estimated weight). Length, weight, cranial and thoracic perimeters were measured in the first hour and at 8 weeks of life of the newborn. Spearman rank correlations were computed to quantify associations between variables.

Results: Reported weight at 20, 30 years old and highest adult weight correlated with newborn's weight (0.41 to 0.45, $P < 0.05$) and there was a trend for a correlation between mother's weight at 32 weeks of gestation and the newborn's weight (0.38, $P = 0.06$). Reported weight at 20, 30 years old and highest adult weight also correlated with newborn's length (0.41 to 0.44, $P < 0.05$). Mother's weight measured between 24th and 28th weeks and at 32nd weeks of gestation also correlated with newborn's length (0.45 and 0.47, all $P < 0.05$).

Conclusions: Our results suggest that women's weight history with or without diabetes is related to newborn's growth measurements.

No conflict of interest

Secondary diabetes

P-1476

Differential effects of olanzapine and risperidone on plasma adiponectin levels over time: results from a 12-week prospective open-label study

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Aims: Second-generation antipsychotics (SGA), especially clozapine and olanzapine, are associated with an increased metabolic risk. They may induce weight gain, metabolic syndrome (MetS), impaired glucose tolerance/impaired fasting glucose (IGT/IFG) and/or diabetes mellitus. Recent research showed that plasma adiponectin levels, an adipocyte-derived hormone that increases insulin sensitivity, vary in the same way in schizophrenic patients as in the general population according to gender and adiposity. The aim of the present study was to investigate whether different SGAs might vary in their effect on plasma adiponectin levels independent of body mass index (BMI) and MetS status.

Methods: 113 schizophrenic patients (65.5 % males, 32.3 years old, average GAF score 4.5) who were free of antipsychotic medication were enrolled in this open-label prospective single-centre study and received either risperidone (n=54) or olanzapine (n=59). The two groups had similar baseline demographic and metabolic characteristics. They were followed prospectively for 12 weeks. Average daily dose was 4.35 mg/day for risperidone and 17.36 mg/day for olanzapine. Plasma adiponectin levels as well as fasting metabolic parameters were measured at baseline, 6 weeks and 12 weeks.

Results: Baseline BMI (23.7 vs 23.2 kg/m^2), prevalence of MetS (adapted NCEP-ATPIII criteria: 7.4 vs 8.0%), mean fasting plasma glucose (FPG) (86.8 vs 86.9 mg/dl), fasting plasma insulin (FPI) (11.4 vs 12.0 mIU/ml) and plasma adiponectin levels (10154 vs 11280 ng/ml) were similar in the risperidone group and in the olanzapine group, respectively. A significant increase in body weight was observed over time in the olanzapine group as opposed to a numerical increase in the risperidone group (+7 kg vs +3.1 kg, $p< 0.05$). Slight but not significant differences were observed in MetS prevalence (increase from 7.4% to 20.4% with risperidone vs increase from 8.5% to 33.9% with olanzapine), in FPG (from 86.8 to 88.0 mg/dl with risperidone vs from 86.9 to 89.2 mg/dl with olanzapine) and in FPI (from 11.4 to 10.8 mIU/ml with risperidone vs from 12.0 to 14.0 mIU/ml with olanzapine). We observed a significant ($p =0.0002$) treatment by time interaction showing an adiponectin increase in the risperidone-treated patients (from 10154 to 11124 ng/ml) and an adiponectin decrease in olanzapine-treated patients (from 11280 to 8988 ng/ml). This effect was independent of BMI and the presence/absence of MetS.

Conclusion: the differential effect of antipsychotic treatment (risperidone vs olanzapine) on plasma adiponectin levels over time, independent of BMI (and MetS), suggests a specific effect on adipose tissues, as already reported in animal models. The observed specific olanzapine-associated reduction in plasma adiponectin levels may at least partially contribute to the increased metabolic risk of olanzapine compared to risperidone.

No conflict of interest

P-1477

The prevalence of the metabolic syndrome in a cohort of HIV positive patients on highly active antiretroviral therapy

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Aims: To assess the prevalence and the pattern of the metabolic syndrome in HIV-positive patients attending the anti-retroviral clinic of the University College Hospital, Ibadan and to compare the prevalence and pattern among the HAART exposed, HAART-naive and HIV-negative subjects.

Methods: Two hundred and seventy patients were recruited into the study (119 males and 151 females). The subjects were selected by systematic random sampling; their demographic, clinical and laboratory data were obtained and analysed using the SPSS software version 16.0.

Results: The mean age of the HAART exposed group was 40.1±9.5 while the mean ages for the HAART naive and HIV-negative groups were 37.7±9.3 and 41.9±8.9 respectively. The mean duration of infection from time of first diagnosis for the HAART exposed group was 22.4±15.7 months. The mean weight, BMI, waist circumference, systolic blood pressure, fasting plasma glucose were all higher in the HAART exposed group than the HAART-naive group, $p< 0.05$. The HIV negative group had the highest mean weight, waist circumference, systolic blood pressure, diastolic blood pressure and HDL cholesterol, $p< 0.05$.

The prevalence of the metabolic syndrome in the HAART exposed group based on the International Diabetes Federation definition was 38.1% while the prevalence of the metabolic syndrome in the HAART-naive group and HIV negative subjects was 13.6% and 28.9% respectively, $p< 0.001$. The prevalence was much higher among patients on protease inhibitor inclusive therapy than patients whose drug combination did not contain a protease inhibitor, 42.1% versus 37.0% ($p> 0.05$).

Conclusion: The result of this study has shown a significantly higher fasting blood glucose, waist circumference, body mass index, systolic blood pressure and diastolic blood pressure in the HAART exposed group than the HAART-naive group. The prevalence of the metabolic syndrome based on the International Diabetes Federation defintion was highest in the HAART exposed subjects. Thus, HIV positive patients on HAART may be at an increased risk of cardiovascular events.

No conflict of interest

P-1478

Glucose intolerance among HIV/AIDS patients in the Plateau region of Northern Nigeria

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Background: HIV/AIDs is an enormous health problem in sub-Saharan Africa. Many persons living with HIV/AIDs have access to Highly Active Antiretroviral therapy (HAART) in Nigeria and these people constitute a 'highrisk' group for developing glucose intolerance (IFG, IGT and DM). Lipodystrophic changes are seen in ambulatory HIV-infected patients. Glucose intolerance (GI) and its associated risk factors among HIV/AIDs patients have not been extensively studied in Nigeria.
Objective: To determine the prevalence of glucose intolerance and associated risk factors in HIV/AIDs patients.
Methods: Five hundred and eighty four consecutive patients attending the HIV clinic of the infectious Diseases Unit of Jos University Teaching Hospital in Plateau State, Nigeria were recruited for the study. Demographic data, personal and family history, and clinical data and anthropometric measurements were obtained. Each patient had fasting plasma glucose (FPG), fasting plasma insulin (FPI) assayed after 8-12 hours overnight fast and glucose tolerance test (OGTT) with 75g glucose. GI was defined as follows: IFG =FPG 6.1-6.9 mmol/l, IGT = FPG< 6.1mmol and 2hrsPGL 7.8 – 11.0 mmol/l and DM= FPG≥7.0 and/or 2hr PGL ≥11.1 mmol/l. Serum Lipids, CD4 cell count and viral load were also determined.
Results: Of the 584 patients studied, 384 (130 males and 254 females) with mean age (range) of 38 (20-64)years were HAART-treated; while 200 (61males and 139 females) with mean age (range) of 33 (18-62)years were HAART-naïve.
Overall, the prevalence of GI was 40.4% (IFG 19.5%, IGT 11.5% and DM 9.4%). Prevalence rates of IFG (27.1%) and DM (11.2%) in HAART-treated patients were significantly higher than those in HAART-naïve patients (IFG 5.0%, DM 6.0%), p<0.005. Conversely, IGT was more prevalent in HAART-naïve than in HAART-treated patients (19.5% and 7.3% respectively), p<0.05. The proportions of patients with GI were higher in overweight and obese HAART-treated patients with moderate CD4 cell count, 200 – 500 ($x10^6$ cells/L); while in the HAART-naïve patients, GI was more prevalent in underweight subjects with CD4 cell count <200 ($x10^6$ cells/L). The mean FPI in HAART-treated patients (41±4.1μU/ml) was similar to that of HAART-naïve patients (39.9±3.5μU/ml), p>0.05. FPI increased in HAART-treated patients with increasing duration of treatment. The risk factors for GI included age, increasing BMI, low CD4 cell count, metabolic syndrome and HAART treatment duration. Strong independent risk factors were, low CD4 cell count and HAART treatment duration.
Conclusion: The prevalence rates of GI among these highland Nigerian patients with HIV/AIDs are high. The prevalence of DM in them is thrice higher than that recorded in the general population in the region. Treatment with HAART and low CD4 cell count are strong independent risk factors. Attention should be paid to identification of glucose intolerance in patients with HIV/AIDs, particularly those on treatment with HAART.

No conflict of interest

P-1479

3-year incidence rates of metabolic syndrome and glucose abnormalities differentially affected by typical and atypical antipsychotics in first-episode patients with schizophrenia

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Aims: Second-generation antipsychotics (SGAs) are associated with an increased risk of development of metabolic syndrome (MetS) and diabetes. There are limited data on the prevalence of MetS in patients with schizophrenia at the onset of the disorder, and specifically no data on patients treated in the era when only first-generation antipsychotics (FGAs) were available. The aim of the present study was to investigate whether SGAs might more markedly affect the rate of MetS than FGAs in schizophrenic patients with first episode.
Methods: data from a historic cohort of consecutively admitted first-episode patients with schizophrenia treated with FGAs (n=148) were compared with an age and sex matched series of consecutive first-episode patients treated only with SGAs (n=148). Rates of MetS (adapted NCEP-ATP III criteria) were compared at baseline and after an average treatment exposure of 3.7 years in the SGA group (n=122) and of 3.2 years in the FGA group (n=108).
Results: the average increase in body weight was twice (p<0.0001) as high in patients started on SGAs (11.5 kg) compared to FGAs (5.2 kg). At first episode there was no difference in the prevalence of MetS between the historic (5.4%) and the current cohort (4.7%). Rates of MetS increased over time in both groups (from 5.7% to 13.1% with FGAs vs from 5.6% to 30.6% with SGAs). Patients started on SGAs had a three times higher incidence rate of MetS (odds ratio 3.6; CI 95% 1.7-7.5). The difference in MetS rate over time was mainly explained by changes in fasting plasma glucose (FPG) and triglycerides. FPG remained almost stable (from 89 to 88 mg/dl) with FGAs, whereas it increased from 84 to 89 mg/dl with SGAs (group by time interaction: p=0.001). At 3 years follow-up impaired fasting glucose was more frequent in patients on SGAs than in those on FGAs (p=0.04). In both groups, 2 patients developed diabetes, and 2 additional SGA patients were started on metformin for sustained prediabetic abnormalities. MetS was significantly more prevalent in patients treated with clozapine (58.3%) or olanzapine (47.1%), and least prevalent in patients on aripiprazole (10%) (p= 0.0092). The difference in MetS incidence rate between the FGA group and the SGA group (amisulpride, aripiprazole, risperidone, quetiapine: n=62) was no longer significant when patients started on clozapine (n=12) or olanzapine (n=34) were excluded (MetS rate at follow-up FGA 13.1% vs SGA 16.1%; NS).
Conclusion: rates of MetS at the first episode of schizophrenia today are not different from those of patients 15 to 20 years ago, arguing against a major role of lifestyle changes between the two periods to explain the currently reported high prevalence of MetS. Rates of MetS increased over time in both groups, with a threefold increased risk in SGAs compared to FGAs. Clozapine and olanzapine have a more negative impact on the incidence of MetS compared to FGAs in first episode schizophrenic patients.

No conflict of interest

P-1480

Screening for cystic-fibrosis-related diabetes and impaired glucose tolerance: systematic review and economic modelling

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Background: Approximately 40% of people with cystic fibrosis (CF) develop cystic-fibrosis-related diabetes (CFRD). The risk increases with age. Survival from CF has improved greatly over recent decades and the prevalence of CFRD will continue to increase. There is uncertainty about the best methods of screening for CFRD and when to start treatment. The current gold standard screening test is the 2 hour oral glucose tolerance test (OGTT), but this has shortcomings. The OGTT can identify people with diabetes or impaired glucose tolerance (IGT), but misses those who have normal blood glucose values at 0 and 120 minutes but high values at 30, 60 and 90 minutes. This project asks two questions: 1) does screening for diabetes or IGT in people with CF improve outcomes and 2) if so, what is the best screening test or combination of tests?
Methods: A systematic review of the evidence on both screening and treatment. Exhaustive literature searches have been done of several bibliographic databases and the grey literature, with no restriction on language or study type. Experts in the area have been contacted for unpublished literature.
Economic modelling will use the software package Simul8. The model will be populated from the evidence gleaned from the systematic reviews.
Results: In terms of treatment for CFRD, the review shows a paucity of randomised controlled trials, with nearly all evidence coming from case series. Insulin remains the standard treatment and there is insufficient evidence for the use of oral agents. There is insufficient evidence on when to start insulin. Studies do not report on all outcomes including the quality of life gains from using insulin.
In terms of screening, results will include the sensitivity, specificity and cost-effectiveness of screening tests or combinations of tests including fasting plasma glucose (FPG), HbA1c, CGMS, blood glucose profiles and the OGTT. The review so far shows that neither FPG nor HbA1c are sensitive enough for screening purposes.
The best screening strategy will depend on the stage of hyperglycaemia screened, and the stage at which treatment should start needs to be considered. Further results of the reviews and of the subsequent modelling will be

presented at the World Diabetes Congress.
Conclusion: There is a shortage of high quality evidence on this important and increasing condition and we will identify research needs. Our preliminary conclusions are that screening is necessary since harm from hyperglycaemia can occur before symptoms develop.

No conflict of interest

P-1481

Metformin or sitagliptin as single treatment in glucocorticoid induced diabetes mellitus - a prospective study

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Aims: Glucocorticoids are known to be the first cause of secondary-induced Diabetes Mellitus when used as long-lasting treatment for various diseases. The aim of the present study was to compare the antihyperglycemic efficiency of Metformin and Sitagliptin when used as monotherapy for Glucocorticoid-induced Diabetes Mellitus (GCDM).
Methods: Forty-two patients with newly diagnosed GCDM were enrolled for this study and were followed up for 6 months. All of them, aged 65.5±7.5, were daily receiving Prednisone 20-30 mg for at least three months. The initial levels of HbA_{1c} in our target group ranged from 8.1 to 9.0. Twenty-three patients were given Metformin as a treatment after the diagnosis (maximum dosage, 2000mg) and formed the Metformin Group (MG), while the remaining 19 were treated with Sitagliptin (maximum dosage 100mg) forming the Sitagliptin Group (SG). At the sixth month of the follow up the level of HbA_{1c} was measured in the blood and was used for the statistical evaluation of the groups. For the statistical analysis the nonparametric Mann-Whitney test and the unpaired t-test were used.
Results: Eighteen patients (78.3%) of the MG group and 10 patients (52.6%) of the SG group had HbA_{1c} equal or less than 7.0% six months after the treatment started. For the MG group, the values of HbA_{1c} were 6.861±0.227 (range, 6.5 - 7.3) with 95% Confidence Interval 6.763 to 6.959. Accordingly, for the SG group HbA_{1c} was 7.006±0.281 (range, 6.4 - 7.4) with 95% Confidence Interval 6.867 to 7.144 (p= 0.078 Mann-Whitney test, p= 0.076 unpaired t-test).
Discussion/Conclusion: When used as monotherapy in patients with newly diagnosed GCDM, Metformin and Sitagliptin showed equal capability of controlling the glucose blood level. Although treatment with Metformin seems to lead to better levels of HbA_{1C} than Sitagliptin, results of this comparison were not statistically quite significant to support that suggestion. Furthermore, weaknesses of this study, such as the small series of patients and the short time of follow up, cannot amplify our conclusions.

No conflict of interest

EDUCATION

Diabetes education in childhood and adolescence

P-1482

Camp Adam Fisher: evolution of a summer camp for children and adolescents with diabetes in South Carolina, USA

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Background/Aims: Camp Adam Fisher is the Carolinas' largest overnight camp for children and adolescents aged 6-16 years with diabetes. Founded in 1968 by Mr. Adam Fisher in memory of his young daughter who suffered from type 1 diabetes, the camp has operated uninterruptedly for the past 40 years. Since 1984 it has been held at the Cooper 4-H Leadership Center of Clemson University in Summerton, South Carolina. Attendance has grown from 17 campers to over 200 in 2008. Initially designed and operated by volunteers of the American Diabetes Association, the camp became incorporated and achieved its not-for-profit status in 2002. It is held for one week each summer and offers a multitude of activities including ball sports, rope-climbing, wall-climbing, indoor gymnasium, horseback riding, swimming, water-sliding, and lakefront activities (canoeing, kayaking, tubing, sailing, pontoon trips, boating, fishing and jet-ski). The camp has a medical director and is staffed by volunteer physicians, nurses, dietitians, and counselors. We assessed the participants' baseline diabetes self-management skills and the impact of camp attendance on them.
Methods: 70 campers aged 12-16 years were given an 18-item self-administered questionnaire designed to measure confidence in diabetes self-management (e.g. blood glucose targets, glucose self-monitoring/meter use, insulin injections, addressing hyper- and hypoglycemia, pump skills) on the first day of camp and repeated on the last day of camp. Responses to all questions were based on a 5 point likert scale (1=not confident, 5 =very confident). Paired t-tests were used to examine differences in pre- and post-camp scores.
Results: Mean scores from both pre- and post-tests were above 3.5. For the whole group, mean scores for 17 of the 18 questions increased from pre- to post-test, 7 of them significantly ($p<0.05$). When the data were analyzed by number of years of camp attendance, a significant increase in all scores were seen among first-time campers (n=21).
Discussion: The philosophy of Camp Adam Fisher of South Carolina, USA is to provide the opportunity to youth with diabetes to grow mentally, physically and spiritually. The experience aims to help them face challenges, and develop problem-solving and leadership skills in a monitored, socially interactive, and wholesomely competitive setting. Our results show that youth older than 12 years who choose to attend camp may be a motivated group who feel secure in dealing with their disease. Reassuringly, camp attendance led to improved confidence and self-efficacy regarding diabetes self-management, especially in first-time attendees. We plan to continue to obtain periodic feedback from participants and counselors in order to enhance the camp's mission in the future.

No conflict of interest

P-1483

Diabetes camps in Latin America

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Introduction: It is widely known that diabetes camps have a very positive impact on children's lives It has been shown metabolic improvements, leading to delay in complications development, after participating in a diabetes camp, which seems more evident when the experience is repeated. The diabetes control gain is not only attributed to the acquisition of knowledge, but also to the psychosocial positive impact of spending days with peers who have the same condition, in a planned safe and fun environment. Sharing experiences and learning from more experienced individuals, children become motivated and realize the worth and benefits of keeping on good diabetes self-control, and that the barriers of living with diabetes are not insuperable.
Objectives: Identify the number of diabetes camps in Latin America, their location, and number of children and adolescents with diabetes who attend them yearly.
Methodology: A questionnaire in Spanish was sent to diabetes association, federations, groups and prominent people in diabetes field, in 21 countries and 2 commonwealths (Puerto Rico and Aruba).
Results: 18 have replied, 15 organize at least one camp session a year. The yearly number of camp sessions in Latin America is 56, with a mean number of sessions per country of 3±2.75SD (between 0 and 9). The total number of campers is 2,211, and the number of campers per session varies from camp to camp (between 9 and 120). Diabetes camp sessions were reported in: Argentina, 3 sessions a year; Bolivia, 1; Brazil, 6; Chile, 3; Colombia, 2; Cuba, 9; Dominican Republic, 5; Ecuador, 3; El Salvador, 1; Guatemala, 2; Mexico, 7; Paraguay, 1; Puerto Rico, 7; Uruguay, 2; Venezuela, 4. Some organizations have reported that camps are not organized in their country, or that no more than one camp session can take place yearly, because of the lack of resources.
Discussion: Although ~71% of the researched countries and commonwealths organize at least one camp session a year, it is obviously too little, and serves only a tiny fraction of all children with diabetes in this region. According to the IDF Diabetes Atlas 2003, the prevalence of type 1 diabetes among children (0-14 years) in Latin America (SACA plus Mexico) is 43,000. If camps were attended only by this age range, only ~5% of these children could attend a diabetes camp yearly.

Conclusion: Knowing the short and long-term positive impact of diabetes camps on children's life, we strongly suggest international and local communities, organizations and governments to help supporting diabetes camp initiatives, in order to enable the organization of more camps, besides improving and broadening the existing ones.

No conflict of interest

P-1484

Perception of body sizes and the prevalence of overweight and obesity among Nigerian undergraduates

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Introduction: In medical practice, obesity has been directly linked to a lot of morbid disease conditions such as type 2 diabetes, coronary heart disease, stroke, non alcoholic fatty liver. The problem of weight and sizes has always been a subject of concern to young people in different cultures of the world. Various reasons have been adduced to different perception of people about sizes and weights. In western culture, a woman's beauty is based on how slim she is – as beauty pageants and models are chosen on their stature. Whereas, the traditional African setting perceive woman based on how well endowed she looks.

There is a paucity of literature on the prevalence of obesity in young adults in our environment. This study was carried out to:

1. Determine the prevalence of overweight and obesity among undergraduates in O.A.U. Ile-Ife.
2. Assess for mismatch the perception of body sizes and body mass index among undergraduates in O.A.U. Ile-Ife.
3. Assess the impact of life styles on weight status

Method: This is a cross sectional study carried out among undergraduates of O.A.U. Data was collected using structured self administered questionnaire. This contained 2 parts;

1. to assess their knowledge and perception of their body status
2. to measure their anthropometric parameters

Data were analysed on SPSS and the results presented as means, standard deviation and frequency and percentages.

Results: Six hundred and twenty respondents who completed the questionnaire and had their anthropometric parameters measured were analysed. The mean age of the respondents was 21.52±3.28 years. 88.4% of them were aged between 15-25 years. 43.9% were males and 56.1% females. 49 (7.9%) and 7 (1.1%) were overweight and obese respectively. Thirty-one (63.3%), of those who were overweight claimed to be of normal body size. In all 32% of our respondents had wrong perception of the body size. Two hundred and ninety-five (47.58%) of the respondent exercised out of which 142 (48.16%) exercised adequately (≥3 times a week). Twenty-two (3.5%) of the respondents were hypertensive, while 598 (96.5%) were nomotensive.

Conclusion: The prevalence of overweight and obesity were 7.9% and1.1% respectively. About a third of our respondents had wrong perception of their body size. A large majority of our respondents had inadequate knowledge of obesity and its complications which may be responsible for the high prevalence of overweight and obesity seen.

We recommend educational oriented programme targeted at this young population who are leaders of tomorrow for the prevention of health hazards associated with overweight and obesity.

No conflict of interest

P-1485

A child and parent perspective for determinants of childhood overweight or obesity in school going children in Karachi

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Aims: To analyze the risk factors for overweight or obesity in school children from both child and parent perspective.

Methods: In 2007, we surveyed four private and two public schools. Data on the childrens' sociodemographic variables, dietary habits and physical activity patterns at the school, home and elsewhere were recorded for both parent and child. Physical measurements (height, weight, waist circumference) of both parent and child were taken. Multiple logistic regression was applied to assess the significance of each risk factor for overweight or obesity. Mc Nemar was used for child and parent comparison.

Results: Of the 434 children, data was obtained for 256 parents. Subgroup analysis revealed 71% of parents of normal weight children to be overweight or obese, while 91% parents of overweight/obese children were themselves obese. (p=0.045).For both parent and child, bringing lunch from the canteen: (OR [1.72] CI 1.14,4.83) and ([OR [1.84], 95% CI 1.21,3.45); greater frequency of snacking while watching television: (OR [3.95], 95% CI 3.42,5.26) and (OR [3.32], 95%CI 3.23,4.79) and a greater frequency of fast food visits: (OR [2.83], 95%CI 1.65,12.14) and (OR [3.14], 95%CI 2.42,11.25) were associated with greater odds of overweight or obesity. Of the children, 60% stated having some form of fruit or vegetable on a daily basis, whereas only 39% parents of these children verified this ($p<0.05$). A greater proportion of children participated in more sedentary activity than what the parents were aware of ($p<0.05$). Conversely, a greater proportion of parents stated a greater frequency of fast food visits and television snacking by their child, as compared to what the child had stated ($p< 0.05$).

Discussion/conclusion: To curtail the menace of childhood obesity, a multidisciplinary approach needs to be adopted, with modification of parental behavior and the school environment. Education to the family on the provision of home food, as opposed to canteen food, may provide a healthier alternative to the child as well as a re emphasis on more fruit and vegetable consumption by the child.

No conflict of interest

P-1486

Perceptions of contributors to childhood overweight or obesity: a parent and child viewpoint through focus group discussions

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Aims: To hold focus group discussions (FGDs) with both parents and children in order to gain a richer insight into the perceptions of determinants of obesity in the context of the tradition and culture of our community.

Methods: Three groups of parents were purposively selected, each consisting of 6 individuals, from two private schools and a public school, respectively. The children of these parents were also grouped for a discussion held separate from the parents. The points of the discussion were transcribed onto Microsoft Word and divided into segments according to the emerging themes into analytic units. These meaningful segments were coded with descriptive words.

Results: Most participants voiced views equating an overweight child to a "healthy one" and a symbol of "good motherhood"; western junk food as a "status symbol" and provision of insufficient supervised physical activity at the school. Concerns were raised that activities for girls needed to be maximized at the school who, due to cultural/religious norms, may be inhibited from participating in outdoor activity. The childrens' multitasking between television and internet, this being more "convenient" than any form of additional physical exertion, has resulted in them becoming "couch potatoes". Very concerning was the belief held by certain participants that engaging in sports would deprive the child of time, energy and stamina that could be spent "studying their core subjects in this highly competitive world".

Discussion/conclusion: Themes from the FGDs revealed that the entire infrastructure and mind set of the community needs to be altered to counter the rising trend of obesity. Schools and parents are well placed to bring about a positive change in this respect. This confirmed results obtained from the questionnaire-based studies done on the subject.

No conflict of interest

P-1487

Using a paediatric diabetic compendium to educate diabetic children

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Background: The management of pediatric diabetes is challenging. We provide a series of educational sessions on the basic management of diabetes to all newly diagnosed diabetic children during their hospitalization, followed with similar outpatient sessions. However these sessions are finite, limited in time, place and availability of expert educators. At our centre, we have put together a series of stimulating exercise tools in a Chinese compendium to enhance continuing diabetic management at home. The compendium contents provide information about diabetes in basic facts, treatment principles, ways to keep insulin and its administration, signs of hyperglycemia, hypoglycemia and hypoglycemic management through a simulative play format.
Aim: To investigate the effectiveness of this exercise tool to enhance self-education in a pediatric type 1 diabetes population.
Patients and methods: Newly diagnosed and established type 1 diabetic children aged 8 – 13 years were recruited. A pediatric diabetic compendium in Chinese was provided.
The compendium contents are: - a journal illustrating the adventures of a newly diagnosed eight year old diabetic boy character ("Tong-Tong")
- riddles relating to diabetes terminology, care providers & roles, treatment regimes and devices, etc.
- diabetic "snakes & ladders" game
- diabetic crossword puzzle

Compendium questionnaires were surveyed prior to the compendium, 1-week and 6-week after completion of the compendium. Compendium questionnaires consisted of a set of identical questions to quantify the knowledge of the recruit on various aspects of diabetes management. The overall pre- and post-compendium questionnaire scores were compared against the age of the recruit.
Discussion: We discuss our findings on the use of the compendium tool in educating our pediatric diabetic patients.

No conflict of interest

P-1488

Campaign of sensitization on diabetes issues in scholar's and student's background of Burundi run by the Burundian Medical Student Association

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Context: Diabetes is an important public health problem in the world. The World Health Organization shows that more than 200 million people are diabetic in the world and most of them are in the middle and low income countries.
The same organization predicts that in 2025, there will be 380 million diabetic in the world and 75% of them will be in the middle and low income countries. In Burundi there is no national prevalence studies done but, according to the center for combating diabetes there are diabetics in all parts of the country even if in rural areas. Their study shows also that many people are diabetic without knowing it.
There is then necessity to increase Burundian public awareness of diabetes issue especially to help them prevent it.
The Burundian Medical Students' Association in partnership with Handicap International France managed a large campaign of sensitization for students and schoolchildren of Bujumbura. This campaign took part in the week of the World Diabetes Day, meaning from the 7th to the 13rd of November.
Aim: Overall Enhance diabetes knowledge in school and academic background. Specifically:
- inform youth on physiopathology, clinic, treatment and above all prevention of diabetes;
- help students and schoolchildren adopt a favourable behaviour for prevention of the disease.

Methodology: The programme was done in four steps:
- establishment of contact with high schools' and university's authority and stundents' and schoolchildren's representatives;
- made of schedule for trainings and a questionnaire made by a team of specialists
- trainings campaign made by a team of 5 members for high school;
- organization of conference on the topic "Diabète chez l'enfant et l'adolescent" for students.

Achievement: More than 600 schoolchildren and students were sensitized on diabetes issue. The questionnaire helped us to evaluate their knowledge on diabetes; we found out that their knowledge is 20% in general.

No conflict of interest

Patient empowerment and self-management

P-1489

Knowledge, attitude and practice in diabetes management: how the community people respond in developing countries?

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Aim: Essential component of diabetes management is empowerment of patient on knowledge, attitude and practices on self-management. The purpose of this study was to assess the knowledge, attitude and practices of people with diabetes in managing their condition and daily life.
Methods: 127 subjects were randomly selected from clinical setting.
Semi structured questionnaire was used to gather the information on personal particulars, knowledge about diabetes and practices. Furthermore, weight and height were measured to assess the nutritional status of the patients.
Results: Out of 127 patients 83% and 17% were on tablets and insulin respectively. Over 65% could not explain what is diabetes, 52% did not know the risk factors for diabetes, and 10% did not know any signs or symptoms of diabetes. Patient who knew diabetes can not be cured were 47% and only 56% knew it was not infectious. While 64% and 34% did not know the causes of hypoglycaemia and hyperglycaemia, 46% and 44% did not know how to manage hypoglycaemia and hyperglycaemia. Even though majority (91%) could mention one or more complications of diabetes, 58% mention death and very few knew other complications. Even though 59% thought they had normal weight, 29% were over weight and 2% were obese, nutritional status by BMI revealed that 31% of the patients had normal weight while 31% were overweight and further 31% were obese, only 7% were underweight. Dietary advice was thought to be important for better management of diabetes by 73% of the respondents whereby, 78% have received dietary advice. Other important lifestyle factors assessed were alcohol consumption, 15%, regular exercises 61% and smoking 6%.
Conclusion: There is a need to empower people with diabetes with skills and knowledge which can help them manage the disease more effectively in developing countries like Nepal.

No conflict of interest

P-1490

Diabetes therapy with information technology: the time has come

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Introduction/aims: Since computing has been used to solve the most difficult challenges from cell biology to space exploration, it is almost intuitive that it should be used for diabetes therapy! Our aim in this abstract was to see how many therapeutic programs exist for direct patient use.
Methods: We ran a Medline, Cochrane Controlled Trial Register, SciSearch, EMBase search for evidence proven Diabetes therapy software1986-2009 under six different key words. We defined the following criteria for inclusion: systems with proven efficacy (Decr. HbA1C), cost effectiveness (saving 20%), safety (Decrease Hypoglycemia), and security (HIPPA compatible).
Results: Of 950 trials 56 studies were considered. Of those, 24 were therapeutic. One system was found to fulfill all criteria with improved results: Humalink, and a secod system fullfilled two criteria:Well Doc.
Humalink Has been used by more than 1700 patients since 1993 with proven efficacy (Decr. HbA1c2.3%), cost effectiveness (decr. cost by 70% compared to DCCT), safety (Decr. Hypoglycemia and Hyperglycemia 90%, with no change in

weight) and security (HiPPA compatible).It is accessible by phone and internet. In Well doc pilot study of thirty patients the intervention group received cell phone-based instructions which provided real-time feedback. The average difference in A1C was 1.6%, between intervention and control. Data regarding cost and hypoglycemia not published.
Overall, other ITs used in improving education and social support had borderline results. Few were shown to be marginally effective (HbA1c decr. by< 0.5%), or cost effective (from -5% to +30%) or safe (increased weight or decrease Hypoglycemia 5-10%)
Discussion: Improvement in diabetes outcomes1988-2006 have been dismal, with continued increased mortality in women compared to men. This is despite a time in which three major revolutions occurred simultaneously: First, improved technology of blood glucose self testing and CGM. Second, improved many new interventions like pumps, insulins, oral agents, and transplantation. Third, an explosion of knowledge and proof of the value of good glycemic control Like the DCCT/UKDS.
The only reasonable manner to improve performance is to use computing power to empower patients in such a chronic disease driven by huge data like: FBS, PPG, HbA1c, Fructosamine, Micro Albumin, LDL, HDL, TG, BUN/Cr, etc., add medications, exercise, activity, nutrition and meals, stress and other lifestyle factors influence, etc.
Conclusion: At present the evidence about the clinical benefits of ITs for managing chronic disease is limited. However two promising therapeutic systems need immediate attention for head to head large multicenter trial to compare to conventional care. Humalink has been proven to have efficacy, cost effectiveness, safety, and security with potential to improve diabetes care safely saving billions of healthcare budgets to all stakeholders.

No conflict of interest

P-1491

Barriers and opportunities for delivering diabetes self-management education programs using patient empowerment in Hong Kong

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Introduction: Patient empowerment, based on the frameworks of self-determination and autonomy support, has served as the philosophical basis for diabetes self-management education in recent decades. In order to better apply the philosophy of patient empowerment, the Association of Hong Kong Diabetes Nurses (AHKDN) and Hospital Authority (HAHO) have been organizing seminars and workshops for diabetes practitioners, including nurses. Feedback from participants of these professional education activities provided invaluable insight for delivering patient empowerment programs in Hong Kong.
Purposes: This paper aims to illustrate the barriers and opportunities of delivering diabetes patient empowerment programs and suggest strategies to overcome the barriers.
Method: The barriers and opportunities were drawn from the feedback from participants of three of the most recent professional education activities organized for diabetes practitioners. A round-table discussion between one expert speaker and 30 diabetes nurses in Dec 08 focused on exploring the historical development of diabetes patient empowerment and the feasibility of its use in Hong Kong. A seminar session and a workshop, Hospital Authority Commissioned Training in Jan 09, provided a platform for over 200 diabetes practitioners to discuss their views and concerns with international and local speakers. Interactive activities were used to facilitate small group discussion. Participants' feedback was collected during the discussion and from evaluation questionnaires.
Results: The analysis of the feedback and discussion shows that time consuming is one of the major barriers for delivering empowerment programs. Participants' perceptions show a range of reasons contributing to this barrier. However, participants perceived that patient empowerment promoted better healthcare provider-patient relationship and self-management ability, thus improving patient outcomes in the long run. On behalf of AHKDN, we suggest that diabetes practitioners shall start using patient empowerment with motivated patients to develop confidence and competence.
Conclusion: The practice of patient empowerment in Hong Kong will bring diabetes education to a new level of care provision and poses both challenges and opportunities for diabetes practitioners. AHKDN will stand in the forefront to provide the best possible diabetes education to patients and continue to organize professional training programs. AHKDN will lobby for managerial support to make this possible.

No conflict of interest

P-1492

Provision of financial assistance and regular self care management sessions to the needy with diabetes is effective in reducing their HbA1c levels

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Introduction: According to the Ministry of Health, Singapore, diabetes counts as the 7th principal cause of death due to its complications. With the increasing number of those with diabetes it is important to prevent or delay the occurrence of complications to improve the quality of life and reduce the health care costs. Poor financial status and poor knowledge of diabetes has been recognised as a barrier to diabetes care. Patients can become depressed if they are both ill and in financial difficulty.
Objective: As shown by the DCCT and UKPDS results, a 1% decrease in HbA1c correlates to a 35%-60% reduction in risk for microvascular complications
The Financial Assistance (FA) program was started to provide the needy individuals with diabetes with free medical supplies and diabetes education and screening to better manage their diabetes. Through this assistance, we aim to achieve a reduction in their HbA1c levels to less than 7% over a period of 1 year.
Method: A 10 months study conducted on a total of 309 FA patients approved. They had their HbA1c test done during their initial visit followed by every 3 monthly till the end of their assistance period. During this period of assistance, a monthly assessment is required. The FA patients are required to produce their log book and glucometer every visit to monitor their improvement in BSLs. Each visit is accompanied with a counselling session on management of diabetes. The counselling sessions on management of diabetes includes:

- Diet modification
- Exercise
- Medication and Insulin Therapy
- Hypoglycaemia and Hyperglycaemia: Signs & Symptoms and Management
- Sick day management
- Self blood glucose monitoring

Diabetes complication screening such as Diabetic Retinopathy Photography, Diabetic Foot Care and Screening, Microalbuminuria and Full Lipid Profile will be rendered.
The efficiency of the FA program is assessed by the difference seen in the HbA1c level of the patient from their initial visit to the end of their financial assistance period.
Results: At the end of the 10th month period, results show that:

1. There is a 13% decrease in the number of FA patients who presented an HbA1c of >8%.
2. There is a 10% increase in the number of FA patients who presented an HbA1c of <6.9% as compared to
3. their initial visit.

Conclusion: The Financial Assistance program has proven effective in reducing the HbA1c levels of the patients and thus reducing their rate of complications. Through the regular education sessions, the patients are better equipped with knowledge in regards to diabetes management. This empowers them towards better diabetes control. With the provision of free medical supplies and regular follow up, it help these patients in reducing their financial burden and in turn motivates them towards positive self empowerment.

No conflict of interest

P-1493

Factors related to diabetic patients' adherence to drug therapy

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This descriptive cross-sectional study was accomplished at a Center for Research and University Extension located in the state of Sao Paulo, Brazil, in 2007.

Objectives: evaluate the factors related to patient adherence to drug therapy related to diabetes mellitus and associate the diabetic patient's adherence to the drug therapy with some variables: the patient, the professional-patient relationship, the therapeutic scheme and the illness.

Method: The population was constituted of 46 patients with type 1 and type 2 diabetes, who met the criteria for inclusion and exclusion. Patients were predominantly female patients, with an average age of 57 years, 8 years of study and 4.5 minimum wages. The majority of the subjects have type 2 diabetes, with a median diagnosis time of 12.5 years, and the most frequent co-morbidities were arterial hypertension and dyslipidemia. For data collection, a questionnaire and the test of Treatment Adherence Measure-TAM were used. For the analysis, the statistic software SPSS-11.5 was utilized.

Results: 89.1% of the subjects used oral antidiabetics, 26.1% used Biguanides and Biguanides in combination with Sulfonylureas, 41.3% made use of insulin therapy, and 30.4% received combined oral anti-diabetics and insulin. Concerning patient adherence to drug therapy for diabetes, 78.3% of adherence was obtained. As far as the facility and/or difficulty for adherence, 50% of the subjects obtained the drugs at the Healthcare Unit. The predominance of adherence was higher among men (85.7%) and among the elderly (82.4%); in subjects with more than 12 years of study (88.9%); with a family income higher than 5 minimum wages (90%); and who received information about the disease (84.6%) and specific information regarding the prescribed drug (86.7%). Adherence was higher among the subjects with up to 5 years of diagnosis (80%); who did not change their daily routine (81.1%); who did not mention side effects (93.8%); who did not use anti-hypertensives (84.2%) and who showed knowledge gaps (80.8%). It is worth mentioning that non-adherence prevailed among individuals with HbA1c higher than 7% (85.7%). For the majority of the factors under analysis, weak association to adherence was obtained and the differences in adherence prevalence were not statistically significant.

Conclusion: the prevalence of adherence obtained in this study was below levels recommended in literature. It becomes urgent for health professionals to acknowledge the importance of measuring patient adherence to drug treatment for diabetes control in case of bad glycemic control and supposed failure in the established therapeutic scheme.

No conflict of interest

P-1494

Diabetes education programme and its effectiveness in reducing HbA1c < 7% in diabetes patients

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Introduction: In Singapore, one out of 11 people aged 18 to 69 has diabetes. That's about 10% of our population or equivalent to 300,000 people. Diabetes is the fifth most common medical condition diagnosed and one of the six top killer diseases in the country. Diabetes is a chronic disease and, if not managed well, can deteriorate steadily to cause devastating complications such as blindness, nerve damage, kidney failure, heart disease and limb amputation. Studies show that about half of patients already have diabetes-related complications at the time of diagnosis.

Objective: The purpose of this program aimed to target patients with diabetes to achieve their HbA1c below 7% after diabetes counselling sessions over a period of one year.

Method: Diabetic Society Of Singapore has worked together with Sing Health through the 'Deliver on Target' program aiming to target patients with diabetes to achieve their HbA1c below 7%.

382 patients were recruited as referred by general practitioners for this program. All of them had their HbA1c test done prior and after the 3 free counselling sessions on management of diabetes. the couselings are conducted by Diabetic Society Of Singapore. Every patient is monitored before and after the 3 free counseling sessions, within 1 year.The counseling sessions on management of diabetes include diet modification, exercise, medication and self blood glucose monitoring.

Results: 382 patients presented results of HbA1c before and after the 'Deliver on Target' program. Before the 'Deliver on Target' program, 150 patients presented HbA1c<7%. After the program, 232 patients presented HbA1c<7%. There is an increase of 54 % of patients in patients with HbA1c less than 7 %.

Conclusion: Early and proactive management of chronic diseases at primary level by diabetes education program has helped many patients with diabetes to gain better knowledge on proper management of diabetes. The 'Deliver on Target' counseling program of 3 free counselling sessions on management of diabetes has proven effective to the patients who presented their results to achieve their HbA1c below 7%. Good glycaemic management is important in prevention of complications.

No conflict of interest

P-1495

Application of patient empowerment strategies in enhancing patient outcomes in a diabetes self-management education program in Hong Kong

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Introduction: Guided by the Michigan patient-empowerment philosophy and culturally appropriate education strategies, a structured diabetes self-management education (DSME) program for Chinese patients with type 2 diabetes was implemented and evaluated in Hong Kong. Four diabetes nurses delivered the program (three 4-weekly sessions) to groups of 10 patients in 4 diabetes centers. Program evaluation reported elsewhere showed significant improvement in participants' diabetes self-efficacy, self-management behavior and glycaemic levels.

Aim: This paper reports how the strategies were used to enhance patient learning in four selected areas of the program.

Use of strategies: A teaching kit was developed to help facilitators deliver the DSME program. It contains 180 power point slides, a logbook, a handbook and an exercise VCD. Interactive learning strategies such as peer teaching, small group discussion, story telling, games and role-playing are adopted. To facilitate participants' development of DSM ability, the patient empowerment strategies applied in the program have been identified by diabetes nurses in Hong Kong as culturally appropriate.

1. Home work on SMBG along with a diary on food and activity was introduced to participants in the first session. The aim was to capitalize on their experience on experimenting the impact of food and other factors on blood glucose levels. Peer sharing (support) and role modeling took place in every session to stimulate participants' active discussion of the experiments.
2. To learn about the principles of diabetes diet, the essence was written in rhyme, named as "10 principles of a diabetes diet". Participants rapped it together to enhance memory. Menus from popular restaurants were collected for participants to discuss and practice making choice in real eating out situations.
3. To learn about diabetic medications, multiple choice questions about drugs were designed to challenge participants to identify common misconceptions from the questions. Real life problems were set up as case studies for developing their problem solving ability. Story telling was used to increase their awareness of asymptomatic nature of diabetes.
4. To learn about physical activity, a 30-minute exercise was designed and demonstrated to guide participants to experience exercising together in groups. A VCD was to take home as a memory aide.

Conclusion: Our findings confirm that using culturally appropriate patient empowerment strategies enhance patient learning. Interactive and participative learning are well accepted by Chinese patients, and are effective in enhancing desirable patient outcomes.

No conflict of interest

P-1496

Financial assistance and strength of commitment to recommended lifestyle self-management among African-Americans with type 2 diabetes

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Aims: Describe the relationship between socio-economic status and the strength of commitment to following dietary and exercise self-management recommendations among persons with type2 diabetes in the rural Tri-County (Somerset, Wicomico, and Worcester) area of the Maryland Lower Eastern Shore.

Methods: The Commitment to Lifestyle Self-Management (CLSM) instrument was used to assess the strength of commitment to following lifestyle self-management recommendations among persons with Type 2 diabetes. Approximately 50 African-American members of type 2 diabetes support groups were surveyed. Descriptive statistics, Crosstabulation, and Chi-Square were computed.

Results: The target audience consisted of 70% females, 30% males, 32% married and 40% widowed. Approximately 35% of the participants indicated more than one source of financial assistance, 37% of the participants reported Medicare and 28% indicated private health insurance. Approximately 45% of females and 43% of males in this study received <50$/month and spent >50$/month on medical expenses. Women, especially widowed, received more financial assistance than men. Significant differences were also found between widowed and married participants. Married showed the least dedication to dietary recommendations: preferring to eat three times a day, [X^2 (4, N=50) p=0.01]; having time to buy the foods[X^2 (4, N=50) p=0.03]. Being widowed and having financial assistance for medical expenses were associated with high strength of commitment to dietary management. No significant difference was found for dedication to weight control between married and widowed. Walking was common and low exercise duration (0-3hours/week) was reported.

Discussion: Previous study conducted among Black groups in Miami, Florida and Abidjan, Côte d'Ivoire using the same instrument (CLSM) reported that ethnicity, marital status, frequency of blood glucose checking, having a schedule for meals and snacks, were significantly correlated with participant's strength of commitment. The present study not only confirmed the previous results but also indicated that being widowed and receiving financial support for medical expenses were associated with high strength of commitment to dietary self-management. Adherence to diabetes self-management is a multi-factorial phenomenon. Individualized comprehensive assessment of strength of commitment and availability of financial assistance for medical expenses should be considered before goal setting during counseling among African-Americans with limited resources in the Tri-County area of the Maryland's Lower Eastern Shore.

No conflict of interest

P-1497

The creation of Beyond the Basics resources for educators and consumers

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Background: New medications and methods of managing diabetes have prompted changes in diabetes education. The Canadian Diabetes Association meal planning system, Good Health Eating Guide (GHEG), was reviewed. Consumers, health professionals and food manufacturers were surveyed about the use and utility of the GHEG. They indicated a need for a simpler meal planning guide, similar to those used in Quebec and the United States, which are based on 15 g of carbohydrate per serving in each of the carbohydrate containing groups (Grains & Starches, Fruits, Milk & Alternatives, Other Choices.) For more than six years, a dedicated volunteer group of health professionals representing a wide variety of expertise and geographic locations have revised the meal planning guide and created consumer resources.

Aim: To revise the meal planning system to be more in line with similar meal planning systems used in Quebec and the United States, and provide consumers with up-to-date information for managing their diabetes. Changes were made to simplify meal planning and also better reflect Canada's multicultural society and eating habits.

Method: From 2003 to 2005, the committee worked on creating food lists of the different food groups. Portions of carbohydrate foods were revised to provide 15 g of available carbohydrate gathered from data in the Canadian Nutrient File and the USDA database. The glycemic index and saturated fat content were also considered. The Beyond the Basics poster was the result of many iterations and consultations with volunteers and staff.

From 2005 to 2007, with the help of many volunteer authors and reviewers, the committee worked on writing and reviewing the chapters of the two manuals, Beyond the Basics: Meal Planning for Diabetes Prevention and Management and Beyond the Basics: Lifestyle Choices for Diabetes Prevention and Management, which include information on the food groups, ideas for meal planning, label reading, physical activity, high risk populations, and many more topics to help manage diabetes. The first manual on meal planning was launched in June 2006. The second resource on lifestyle choices was launched in June 2007.

Result: The Beyond the Basics suite of resources was created to assist both health professionals and clients to improve eating habits and aid metabolic control.

Conflict of interest:
Employee: Canadian Diabetes Association

P-1498

Therapeutic adhesion and other related factors in persons with diabetes mellitus type 2

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Introduction: Diabetes Mellitus is a disease that demands from patients to keep a strict discipline in following the instructions given by the health team.

Objective: To determine the therapeutic adherence of patients with diabetes mellitus type 2, as well as the linked factors that contribute to or hinder the adequate accomplishment of the prescribed treatment.

Method: 212 subjects were studied when they attended the follow-up consultation at the Center for the Attention to the Diabetic Patient from the National Institute of Endocrinology in the City of Havana, Cuba. As a tool was used the Questionnaire for the Evaluation of Therapeutic Adherence in persons with diabetes mellitus type 2.

Results: The results yielded a total therapeutic adherence in 57.0% of the studied subjects, with predominance for the female sex. 85.8% considered important to carry on the treatment for the adequate metabolic control; 88.7% can count on enough social support from family and health institutions. The factors linked to a satisfactory therapeutic adhesion were: the confidence in the treatment as beneficial; the knowledge of the disease and its complications; self-effectiveness, and the support from the family and health institutions. The imputations about the failure to comply with the treatment due to economic problems, irregularities in working timetable, and the absence of a more trustworthy, efficient method for a glycemia checks, were referred to as hampering factors for a satisfactory performance in the fulfillment of the treatment.

Conclusions: The study contributes general elements that influence on the therapeutic Adherence, thus allowing a better understanding of a complex phenomenon of a worldwide alarming magnitude.

No conflict of interest

P-1499

Diabetes knowledge, attitude and practices in central India

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This unicentric, non-interventional study was conducted to assess the knowledge, attitudes and practices related to diabetes and its care in uncontrolled type 2 diabetic subjects coming for first consultation to a diabetes clinic in an underserved area of central India.
100 subjects with type 2 diabetes aged above 18 years were administered a structured questionnaire. Their mean age was 51.09 yrs with a male female ratio of 1.7:1.8. Subjects were from urban background. 15% had postgraduate education, 30% were graduates and 41% high school qualification. Duration of diabetes was < 5, 5-10 and >10 years in 57%, 22% and 21% respectively. 09 % subjects were on ayurvedic/indigenous medicines. 70 % were taking their treatment daily whereas 17% were taking it irregularly, 13 % took treatment only when they felt symptomatic. 16% did self monitoring of blood glucose once in 7-15 days, with others doing so every 1- 2 months. 26% owned glucometers but did not use them regularly. 68 % patients reported their diabetes was not controlled. 25 % patients consulted their physicians once in 2-3 months or less frequently.
Only 63% patients felt that exercise is necessary in the management of diabetes whereas 32 % felt that exercise should be done whenever there is time. 5 % felt that exercise should be done as per patient's wishes. 61% patients were of the opinion that antidiabetic drugs have to be taken life long whereas 39% reported that these have to be taken till their diabetes is controlled.
47 % of the patients reported problems in routine daily life due to diabetes. 51 % patients had fasting blood glucose > 200mg%, with only 23% reporting fasting euglycemia. 71% had postprandial values > 300 mg/dl, with 16% reporting postprandial euglycemia. Only 33 % were aware about the targets of their control.
Majority of the subjects, in spite of residing in urban area and having formal education, did not have adequate knowledge or appropriate practice about diabetes. Almost all the patients (94%) had the misconception about insulin that it is the last modality of treatment and has to be taken life long once started.
This study highlights the knowledge, attitude and practices related to diabetes in central India, and the scope for improvement in this field.

No conflict of interest

P-1500

"A touch of diabetes" – self-perceived knowledge among people with type 2 diabetes

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Background: Type 2 diabetes is a serious and progressive disease. It is well known that individuals with good understanding of their own condition and treatment and high self-confidence in their self-management of chronic diseases perceive good health.
Aim: The aims of the following study were to describe: self-perceived knowledge regarding type 2 diabetes and experiences of diabetes related worries.
Method: On the basis of the Swedish population 3801 people were randomly selected to answer a questionnaire on if they had been diagnosed as having diabetes. The survey was carried out by telephone by SIFO research international. Out of 3801 randomly selected, 199 people reported that they had been diagnosed as having diabetes (prevalence 5%) and agreed to participate in the study. The questionnaire consists of 15 items.
Results: The age of the participants varied from 40 years to 80 years. A majority of the participants declared that they were overweight or obese. Half of the participants expressed that they had high blood pressure and one third declared that they had high cholesterol. One third of the participants did not know the value of HbA1c, and had also modest knowledge about the diabetes-related complications. Furthermore, 42% had never discussed the risks pertaining to their disease neither with the nurse nor the doctor. The patients had been told that they had a touch of diabetes, and that diabetes is nothing to worry about. Participants who expressed good knowledge had lower HbA1c and BMI compared to those with poor knowledge. The level of knowledge was associated with the educational level, i.e. those with a high educational level expressed high level of self-perceived knowledge. Half of the participants did not talk about any kind of diabetes-related worries.
Conclusion: The results showed that patients with type 2 diabetes need more knowledge and understanding about the disease and the treatment. This highlighted the fact that professionals in the health sector need to explain the seriousness of the disease to the patients in a clear manner. On the other hand, it is the patients' duty to ask for information related to the disease and its treatment. Diabetes type 2 is a serious disease and should not be labeled "a touch of diabetes".

No conflict of interest

P-1501

Tips and tools for diabetes self-management education for people with vision loss

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Diabetes self-management is a challenging and often overwhelming responsibility. Vision loss can make these challenges even more daunting and for some signifies the loss of ability to maintain independence in self-management, such as blood glucose monitoring, insulin and oral medication administration.
Nurses can help people with diabetes and vision loss or blindness access the resources in their community sooner and provide diabetes education to promote independence for the individual. Timely intervention and support by nurses who are sensitive to the needs of the visually impaired and who provide diabetes education to this group are essential for positive patient outcomes. This presentation provides tips and tools for diabetes self-management education for people with vision loss.
This presentation reviews: Common terms and conditions associated with vision loss in people living with diabetes,
Components for nursing assessment of the visually impaired person,
Practical tips and tools for diabetes self-management education, including blood glucose monitoring, insulin and oral medication administration.

No conflict of interest

P-1502

Factors related to self-care of people with type 2 diabetes in a hospital emergency room in Merida, Yucatan, Mexico

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Objective: This correlation study aims to analyze the factors related to self-care of type 2 Diabetes patients.
Method: Participants were 252 type 2 diabetes patients who entered the Regional Hospital of Merida in 2006. Instruments: registration form; questionnaire concerning socio-demographic, clinical and laboratory variables; self-care capacity scale; questionnaire measuring adherence to medical, dietary and physical activity treatment. The information was collected through review of clinical records and interviews. They were analyzed through SPSS version 12.0 software, univariate and bivariate descriptive statistics and correlation analysis.
Results: The population was characterized by predominantly female patients (51.8%), with an average age of 62.88±11.18 years, married (81.7%); predominantly housewives and retirees (27.9 and 25.5%), average education of 9.16±3.94 years, catholics (65.7%), with nuclear family (59%) and family support (84.8%). Average for weight was 71.39±10.59kg, height 1.51±0.07m, with an average BMI of 31.46±5.41Kg/m^2, abdominal circumference of 113±17.59cm; the systolic blood pressure was 126.95±14.26mmHg and diastolic of 83.03±9.35mmHg. The average duration of diabetes was 17.53±9.03 years, up to 6 hospitalizations with an average of 2.30±1.05. The leading causes of admission were hyperglycemia, diabetic foot and hypoglycemia. They have hypoglycemia, neuropathy and diabetic foot as major complications, with a history of diabetes and hypertension. They use oral antidiabetic agents, mainly sulfonylureas and 78% of these people have medical consultations, 48% every two months. The average blood glucose values were

197.29±52.35mg/dl, plasma glucose 209.35±119.02mg/dl; total cholesterol 333.19±69.47mg/dl, LDL 110.82±25.49mg/dl, HDL 37.55±5.53mg/dl and triglycerides 184.81±61.40mg/dl, respectively. The average score for self-care capacity was 35.72±3.69 points, with regular ability for self-care. Average for adherence to the drug treatment was 30.08±3.13 points (adherence:8.8%); for participation in dietary treatment 12.67±1.32 points (adherence:8%) and in physical activity treatment 2.73±1.53 (adherence:5.2%). A direct correlation was found between self-care ability and years of study, disease control and adherence to physical activity, and an inverse correlation between self-care ability and BMI, total cholesterol and LDL, religion, drug treatment, evolution time of the disease and risk factors.

Conclusion: it becomes urgent to implement the guidelines proposed by the Integrated Health Care Model and the Norma Oficial Mexicana for the prevention, treatment and control of diabetes, with a view to developing self-care skills for people with type 2 diabetes to manage the disease.

No conflict of interest

P-1503

The attendance to a regular diabetes health education program interferes in the treatment-management interventions

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Aims: The aim of this study was to correlate the disease knowledge of diabetic people who are submitted to a systematic educational process with the capacity for managing interventions during their treatment. Furthermore, this work sought to analyze the connection between the inclusion of diabetic people in a health education program and the possible alterations in their therapeutics resulting from such process.

Methods: This was a documental, evaluative and ex-post-facto research. It was analyzed both qualitative and quantitative questionnaires which was replied by 78 diabetics who attended a regular health education program which deals with Diabetes Mellitus (DM), health education and oriented physical activities. It included subjective and objective evaluations of the patients' knowledge about DM and their capacity for managing therapeutic interventions during the treatment by attending the program or even by actions resulted from the same. For the subjective questions, a scale of five values (1 - 0.5 - 0 - 0.5 - 1) was selected and, for the objective ones, it was used a percentage scale which ranged from the period before the integration into the program to the period after it. It was studied 40 men and 38 women, with the average age = 59±11, the average time of DM = 9±7 years; 94.87% (n=74) of them was type 2 DM.

Results: 100% of the diabetics who took part in the program have claimed that they increased their knowledge level both about DM and the treatment. The percentage average of the variable 'level of information on DM' before and after the inclusion in the program corresponded to 30.42% and 67.53%, respectively (the percentage change being 110.10%). Moreover, 88.46% (n=69) of the participants affirmed that their capacity for managing interventions during the treatment has increased. This increase reflected in a considerable percentage change of 101.12% when the periods before and after the program were compared taking into account the variable 'capacity/competence to take care of yourself' (average before the program = 39.70% and average after the program= 80.29%). 67 (85.89%) of the diabetics presented changes in their therapeutics during the three months which preceded the questionnaires' reply, and 85.34% of these changes, according to them, resulted from their direct or indirect participation in the program.

Conclusion: It is essential that the diabetic individuals are able to manage interventions during their treatment since the disease often presents new challenges. Therefore, it is highly important their inclusion in a regular educational process which enables them to make decisions and manage interventions during all the treatment, aiming at, above all, the management of the therapeutics.

No conflict of interest

P-1504

Successful outcome of a multidisciplinary team over an individual approach in imparting diabetes patient education

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Introduction: Even in well developed parts of the world, more than 50 % of diabetic subjects have unacceptably high metabolic parameters. When diabetes is growing at incredible speeds crossing rural urban boundaries, the only effective tool remains to be awareness generation.Here we test efficacy of two methods of education.

Aim: Education programs for diabetes are usually conducted in groups. Conventionally a lecture is delivered by a doctor, educator or a dietician. Here we compare the efficacy in response of patients participating in a healthcare professional/paramedical individual (group A) conducted diabetes awareness program versus response from multidimensional elements incorporated diabetes education program by a team of experts (group B).

Method: The response of 51 patients each in two patient groups for a period of 2 years was compared. These patients participated in quarterly diabetes education sessions.

The patient response of two groups was captured on the basis of a Likert Scale Questionnaire.

Discussion: In this study conducted in our centre, the multidisciplinary team (group B) consisted of diabetologists, dietitians, nurses, educators, dentists, ophthalmologists etc. For group A, classes were taken either by doctor or dietitian.It has been observed that patients have learned more on self care, monitoring, life style modifications, periodic physical and lab evaluation at sessions by a team of experts rather than by an individual.

In group B, ophthalmologist and dentist participates once in a year. A dietitian talks to patients twice a year while diabetologist, nurse and diabetes educator attends all sessions. Diabetes Educator could give a clear account on use of glucometers and how to deliver insulins. Moreover a diabetes nurse could explain on medication timing, care for diabetic foot and the importance of periodic lab evaluation. Diabetologist and dietician together could educate the patient mass on importance of equilibrium to be maintained on diet, exercise and medications, time and type of exercise in accordance with carb counting and exchanges.

Results:

RESPONSE OF PATIENTS TO DIABETES EDUCATION		
Parameters in Likert Scale Questionnaire	A single	B team
Skills on monitoring of blood glucose	54%	96%
Time & type of exercise	35%	78%
Importance of carb in diet	44%	75%
Timing of oral drugs & insulin	82%	98%
Eye, Dental & Foot care	36%	87%
Periodic follow up & tests for risk evaluation	51%	93%
Awareness of pens, pumps & CGM	22%	75%

Conclusion: Conduct of repeated patient education sessions is the only way to ensure success in diabetes management. Our study underlines the importance of incorporating multiple disciplines into periodic patient education programs and customizing it, so as to suit the basic education/ethnicity of the patient population.

No conflict of interest

P-1505

Physicians' empathic understanding of patients' personal representations of their type 2 diabetes: accuracy and association with health outcomes

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Aims: The degree of accuracy to which physicians understand the patients' views may be central for promoting self-care and adherence to treatment

and regimen in most chronic illnesses and in Type 2 diabetes in particular. The objectives of this study were to measure general practitioners' accuracy of empathic understanding of patients' views and relate it to health outcomes in Type 2 diabetes.

Methods: Participants were 14 clinicians and 78 of their non-complicated Type 2 patients included in a cross-sectional study. Predictors were empathic understanding measures of patients' views derived from the IPQ-R (Moss-Morris et al., 2002). Outcomes were clinician-rated adherence and self-reported self-care.

Results: We found that accuracy was higher when dealing with beliefs of chronicity and treatment control. Some symptoms were more easily recognized like suffering from upset stomach, fatigue, or loss of strength. In regression models controlling for clinical and personal variables, higher accuracy on reported symptoms, chronicity beliefs and controllability predicted better self-care.

Discussion: These results suggest that accuracy may impact self-care and/or adherence. They may help determine targets for intervention on communication training designed for professionals.

Conflict of interest:
Commercially-sponsored research: Serge Sultan, Sanofi-Aventis
Agnès Hartemann, Sanofi-Aventis

P-1506

Supervised program of physical activities as a mean of diabetes education: longitudinal evaluation of capillary glycemic variation

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Introduction: Education on diabetes and oriented physical activities play an important role in the therapy. Both are part of the treatment and together they can lead to a better glycemic control. A supervised program of physical exercise can be a good way to accomplish and follow the management of diabetes treatment and need a capacitated health provider in exercises. We aimed to verify the capillary glycemic variations in a regular program.

Methodology: Doce Desafio Program promotes diabetes education through an environment of classes of physical exercises. Sample: 48 adults with diabetes who attended ≥25 meetings in the semester: 42% in insulin-therapy, 90% type 2, 60% male, all in physician accompaniment. In each meeting 2 measures of capillary glycemia were made: at the beginning (IG) and end (FG) of activities (110min), including regular evaluations, oriented exercises, lectures, dynamic educative debates. Data from the 3 first meetings and from the meetings nº 23 to 25 were statistically compared (average and standard deviation). It was approved by the Research Ethical Committee.

Results: Average of initial (IG) and final glycemia (FG) in the first meetings were respectively 172±88 (41 to 550) and 134±70 (70 to 353) mg/dl, decrease of 22% in values of Initial Glycemia and reduction of extremes values in amplitude. In the last 3 meetings of 25 the mean results were IG = 158±54 (65 to 329) and Final Glycemia = 112±34 (65 to 247) mg/dl, decrease of 29% in relation to IG and a smaller amplitude of values, indicating a better correctness in the adopted procedures for each individual. A reduction of 9% on the value of IG in participants after 20 classes (<3 months) with a smaller standard deviation, especially in Final Glycemia, indicate a smaller amplitude of oscillations.

Conclusion: The attendance in the program reflected the achievement of lower glycemic levels and closer to normal, showing better control. Programs like this can be useful to achieve the glycemic aim and health and to accompany an adequate treatment.

No conflict of interest

P-1507

Findings from a one-day community diabetes screening and education program by a visiting Certified Diabetes Nurse Educator in Festac Town, Nigeria

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Aims: Diabetes is a debilitating disease that, uncontrolled, can increase the risk of macrovascular and microvascular complications. These outcomes can be abated with screening, early diagnosis and self-management education. The objective of this analysis is to describe the characteristics of the participants of a screening program conducted by a visiting US CDE in a major metropolitan city of a developing country, Nigeria.

Methods: A one-day community-based diabetes screening and 2 hour diabetes education class addressing self-management, complications and ideal target values was conducted. The session was interactive and the participants had the opportunity to ask many questions. A sample of 93 adults aged 18 or higher completed a one-page demographic and history questionnaire. Individuals self reported if they had history of diabetes and/or hypertension. Random non-fasting Blood Glucose (RBG) testing, Blood Pressure (BP), height, weight, age and sex were collected. Participants were considered within goal range if non-fasting RBG was < 140 mg/dl in individuals who did not have a reported history of diabetes or <180mg/dl in individuals with reported history of diabetes. Blood pressure was considered at goal if < 140/90 for individuals without reported history of diabetes or <130/80 in individuals with reported history of diabetes. Pre-hypertension was defined as SBP 120-139 mmHg and DBP 80-89 mmHg.

Results: As a group, the age of the participants was 56.5 +/- 13.3 years (mean +/- SD), RBG 122 +/- 58.5 mg/dl, SBP 132.6 +/- 32.4 mmHg and DBP 76.9 +/- 14.9 mmHg. Only 9.7% reported history of diabetes and 10.6% reported history of hypertension. However, 14.3% of those who did not report a history of diabetes had elevated blood sugar where further screening was recommended, 38.6% of those who did not report a history of hypertension had elevated blood pressures, and 34% of individuals had unidentified pre-hypertension. Even in individuals with a known diagnosis of diabetes or hypertension, less than 1/3 were at their respective goals.

Conclusion: Results from this community-based screening highlight the high prevalence of unrecognized and inadequately treated high blood pressure and diabetes in developing countries. More efforts are needed to educate and increase self-awareness, promote screening and early diagnosis, and implement standards of care for blood glucose and blood pressure control in developing countries such as Nigeria.

No conflict of interest

P-1508

Lectures, tough methods and threats in "educational" programs: strategies related to an unfavorable prognostic of diabetes

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Introduction: The use of inappropriate tools and strategies during the health educational process might worsen clinical conditions and raise fear among diabetics. Educational actions must be planned in consideration of the needs of a group and the partial evaluation of these actions must be used as a tool for redirecting them. Objective: Identifying through literature, the strategies related to failure in educational processes in programs for diabetics. Methodology: Review of literature in the following database: LILACS, BVS/MS, ENSP, PAHO, e MEDLINE. Articles published from 2006 to 2009 were consulted. Results and Discussion: "Educational activities" concerning only the transmission of information, mainly through lectures, and which did not improve the disease prognostic, and reported a higher number of diabetics in their meetings. General and/or tough methods restricted only to the Glycemic control that led to discouragement in the group, raising the fear for failing among patients. Specific goals, made along with the group had better effects in the metabolic control improvement, besides other aspects such as motivation to self-care. Some programmes focused on aspects related to "negative possibilities" as a significant result obtained in case of disregard of the orders from the assistance staff, who lectured about cases or made use of images of wounded

feet, amputations, patients in dialysis, transplanted patients or who have gone blind, arising discomfort in patients, who have related they took part on the programmes only for the given medical supply. Conclusion: Planning educational actions must include the participation of the diabetic to facilitate the engagement on the proposed activities. The relation educator-learner is turned into a cooperative process in which mutual experiences and lessons are exchanged. The knowledge built through this exchange of experiences is the fundamental result of educational practice.

No conflict of interest

Self-monitoring

P-1509

Coping mechanisms in geriatric patients with diabetes

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This multicentric, noninterventional study was done to assess coping mechanisms utilized by geriatric patients with diabetes, and their correlation with gender, glycemic control and duration of diabetes. 36 geriatric patients aged above 65 years formed the study group while 84 young adults aged 18 to 65 years comprised the control. The Cognitive Emotion Regulation Questionnaire (CERQ), 2006 was used to quantify coping mechanisms. This questionnaire assesses 9 different coping mechanisms. Subjects were divided into two groups, one showing above average or higher degree, and the other showing average or lower degree, of utilization, for each mechanism. The percentage of subjects exhibiting above average or higher degree of each strategy was taken for analysis. Rumination was more frequent in geriatric patients than younger adults (50.00% vs 40.47%). However positive coping mechanisms such as acceptance (22.22% vs 47.61%) and putting into perspective (27.77% vs 42.85%) were less common in elderly subjects.This indicated a higher degree of negative coping mechanisms in geriatric patients, pointing towards a greater need for training in coping skills in them. Within the elderly cohort, significant gender differences were noted for catastrophizing (66.66% in female vs 33.33% in males) and other blame (22.22% in male vs 11.11% in females). No differences were noted in coping with regards to rural/urban residence, socio- economic status or duration of diabetes. This study highlights the coping mechanisms used by geriatric patients with diabetes, and highlights the need for coping skills training in them.

No conflict of interest

P-1510

Labeling comprehension and performance evaluation of a new blood glucose monitoring system with integrated information management

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Aim: To evaluate product labeling and performance of a new blood glucose monitoring system (BGMS), determining if untrained subjects and healthcare professionals (HCPs) using fingerstick capillary blood could obtain accurate glucose measurements as compared to YellowSprings Instrument (YSI). A secondary aim assessed subjects ability to understand connecting the BGMS to a computer, review data presentations, perform meter setup, and understand the use of additional features including "AutoLog" meal marking during the 5 second test time, and use of icons and animation designed to improve ease of use. There is integrated data management through USB computer connectivity, an electronic log book display, and a Trends feature that presents pre or post-prandial results based on customizable target ranges. The system automatically detects a control solution result, so it will not be used in average calculations and other blood glucose tracking data. Memory capacity is 2,000 results. The system utilizes a rechargeable battery and full color display.
The study was IRB approved. 79 subjects were enrolled. 5 subjects were discontinued for failing inclusion/exclusion criteria. 3 test strip lots were rotated. Subjects and HCPs tested in parallel. Duplicate capillary blood glucose measurements were obtained to assess system precision. Approximately half the subjects took the system home and tested for 7 to 10 days to assess the robustness of the system. Subjects completed a questionnaire for feedback on ease of use.
Results: The coefficient of determination (R2) adjusted for sample size was 0.960 for both the lay-users and HCPs.
The percentage of combined lot results within ±15mg/dL or ±20% of the mean capillary glucose result obtained by subjects and HCPs is shown in Table 1.

Table: Results within ±15 mg/dL or ±20% of the mean laboratory (YSI) glucose value

Lay-User	98.6% (146/148)
HCP	96.6% (143/148)

Using the Parkes Error Grid, > 97% of results obtained by subjects and HCPs were clinically accurate (Zone A). < 3% were in Zone B. No values fell inside Zones C, D, or E.
Questionnaire results: >95% responded that ease of marking results with AutoLog and ease of accessing memory and blood glucose averages was very good to excellent, and close to 90% found the usefulness of the TRENDS data presentation very good or excellent.
Conclusion: This study evaluated the labeling and accuracy of a new glucose meter in the hands of lay-users and HCPs that was found to be at least 97% clinically accurate based upon Error Grid analysis. Further, the large majority of subjects found the Auto-log feature, access to data in memory and data presentation easy to use and understand.

Conflict of interest:
Employee: Baum J, Greene C, Pardo S, Parkes J, Schachner H are ful time employees of Bayer HealthCare, Diabetes Care
Commercially-sponsored research: This was a study sponsored by Bayer HealthCare, Diabetes Care

P-1511

The relationship between home glucose monitoring and glycaemic control in an urban Nigerian population with type 2 diabetes

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Background: Home blood glucose measurements (HBGM) are recommended components of a modern diabetes self-management. Its value though, is discussed as controversial in developed countries and its impact in resource poor settings where health care cost is often borne by the patients is yet to be documented.
Aim: To determine the relationship between HBGM and glycaemia control in type 2 DM patients of an urban Nigerian population.
Methods: Every third patient with clinic attendance over 1 year at an urban diabetes clinic recruited for the study was requested to complete a questionnaire investigating demographic data, diabetes history and home glucose monitoring practices. Glycaemia control was determined by glycated haemoglobin (HbA1C) using a point of care device.
Results: There were 100 patients studied, 62 (62%) females and 38 (38%) males. The mean age, duration of DM, BMI, FBS, 2HPP and HbA1C of the study population was 59.1 ± 10.6 years, 10.5 ± 7.3 years, 26.7 ± 4.4kg/m ^{2}, 114.8 ± 53.4mg/ml, 135.3 ± 85.7 mg/ml, 8.2 ± 2.2%. HBGM was practiced by 40 (40%) patients, 27 (67.5%) females and 13 (32.5%) males. The mean number of times HBGM was done /month was 9.2 ± 8.2 times. HBGM was practiced more by females, persons on insulin therapy, persons with higher educational level and longer duration of diabetes. The mean HbA1C in the group who practiced SMBG was lower though not statistically significant compared to the group who did not (7.97% vs 8.04%, p= 0.9).
Conclusion: There was no relationship between HBGM and glycaemic control. This may have been due to the inadequate knowledge of the value and infrequent practice of HBGM by the study participants due to the cost implication. There is thus a need for heightened awareness of the value of HBGM and for larger studies in this area to be done in the developing world.

No conflict of interest

P-1512

Effects of the educational process promoted through an oriented program of physical activities to diabetic people in the self-monitoring of blood glucose

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Self-monitoring of blood glucose (SMBG) is essential to the success of diabetics' treatment and support, specially in people with DM1, who are more subjected to glycemic fluctuation. This study aimed evaluating SMBG variations resultant of the participation in this diabetes education program.
Methodology: Qualitative and quantitative study. Structured questions about many aspects related to SMBG were made to 53 DM1 (78% of all type 1 people who had participated in the program until that moment, last 3,5 years) who attended at least 4 classes; the major part of them not regularly were participating. These questions related conditions before and after the attendance: age 24±13 y, time of DM 11±9 y, median of 14 attendances in classes. Qualitative data distributed in categories and statistically analyzed for pondered average.
Results: Main points: Regarding SMBG, 24,4% did not feel oriented, but after the participation this number reduced to 0%. Before the participation, 52,9% checked blood glucose daily and 30,2% $\leq$ 1 time a month; after the participation, 92,4% daily and 5,7% monthly. The SMBG made to check glycemia and to make adjustments changed from 47,9% to 87,5%. Now, 90,2% says to be well oriented regarding SMBG importance, while just 64,2% did the same statement before. 92,4% says to recognize variations which interfere in the glycemic results, against 56,6% from before. 92,5% answered to know interpreting results, against 49,1% from before. Regarding how to do adjustments after checking glycemic rates, 88,7% feels well oriented now, against 41,5% from before. Before, 36,5% always took steps of adjustment after checking glucose, 19,2% often and, 30,8% never or rarely; now 59,6% always took steps and 32,7% often. Presently, 100% considers SMBG important against 78,5% from before. The trust also increased and the discomfort regarding SMBG diminished.
Conclusion: The program was effective regarding training and making people aware about SMBG in the health education field. SMBG is an important tool of DM control, it subject is central in health education recommendations.

No conflict of interest

P-1513

Glycaemic control strategies among adult diabetics attending clinics in a metropolitan area of sub-Saharan Africa: a case study of Dar es Salaam in Tanzania

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Aims: To assess strategies adopted for glycaemic control among adults with type 2 diabetes mellitus attending diabetes clinics in Dar es Salaam, Tanzania.
Methods: A cross-sectional survey was done in July – Sept 2007 involving adult patients with type 2 diabetes mellitus attending diabetes clinics in the city of Dar es Salaam. Data were collected using a semi-structured questionnaire and analysed using Epi-Info version 3.3.2. Statistical significance tests included the usage of X^2 test to check for the association between dependent variables and P-values <0.05 to rule out chance in findings. A verbal informed consent was sought from each respondent before interview.
Results: A total of 400 diabetes patients were surveyed out of whom 136 (34%) were males. None among the study respondents revealed to perform blood/urine sugar tests on a daily basis. Only 2% declared to have personal glucometers/urine glucose dipstick kits at home. Also, 88 (22%) respondents perceived skipping meals to be one of the options in maintaining blood sugar in a euglycaemic state. Almost one third (33.75%) of respondents declared weight gain to be acceptable once a euglycaemic state has been achieved. Significant amount (17%, P = 0.004) of respondents declared traditional medicaments to be safe and equally effective.
Conclusion: Low blood/urine glucose testing reported among study respondents acts as an indicator of poor glycaemic control. Beliefs and perceptions could be highly responsible for poor glycaemic control strategies in this study population.
Recommendations: Continuous health information on glycaemic control strategies need to be provided in these settings. Diabetes health education programmes need to be evaluated regularly in various parts of Africa. More studies on factors influencing glycaemic control strategies should be conducted.

No conflict of interest

P-1514

Comparison between blood glucose checks obtained through Betachek® tape with enzymatic method

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Introduction: Diabetes mellitus is a chronic disease that leads to many complications as damage to small and large blood vessels, resulting in frequent hospitalization. Since the 1990s the incidence of type 2 diabetes has been dramatically increasing in childhood and teenage, before considered an exclusive disease of adult age. The goals of treatment of diabetes requires ongoing medical care as well as patient and family education both to prevent acute illness and to reduce the risk of long-term complications. The frequent control of blood glycemic levels is essential to achieve these objectives.
Objective: The aim of this study was to compare blood glucose checks obtained through instruments Betachek® tape (Tape_B), OneTouch® SureStep® glucometer (GLI) and (hexokinase/G-6-PDH – HEX) enzymatic method.
Methods and materials: One hundred (100) hospitalized patients in the Hospital Universitário Evangélico de Curitiba, were enrolled in this study between 18th Feburary 2008 and 26th of that same month. The glycemias were measured between 1 and 2 hours after lunch (postprandial blood glucose).
Results: The logistic regression analysis determinated that the proposed procedure Tape_B was responsible for 84% of the variance observed in the venous glucose procedure (HEX), being HEX=-17.216 + 1,009* (Tape_B) (p<0,001). These results indicate that the procedure Tape_B can be used as an efficient and lower cost alternative method to obtain blood glucose checks, considering that the regression equation is used in order to estimate the venous glycemia with a lower error.
Conclusion: According to the results acquired, it is advisable to implement this procedure at hospitals and mainly in the everyday monitoring performed by the patient, given them better cost-benefit relations.

No conflict of interest

P-1515

Study of self reported anthropometric measures and glucose, lipid profile in type 2 diabetes

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Background and aims: There is not enough information of accuracy of self reported anthropometry and its relationship with metabolic profile. The aim of this study, therefore, was to evaluate the relationship between self reported anthropometric measures and glucose, lipid profile in type 2 diabetic patients.
Methods: One hundred twenty (35 men, 85 women) diabetic patients (mean±SD age 53.83±9.9), were recruited from the National Institute of Nutrition & Food Sciences Clinic. Anthropometric parameters (height, weight, BMI, circumference hip, waist circumference, and waist-to-hip ratio), lipid profile, FBS, 2 hours post prandial glucose, HbA1C, Hemoglobin of all patients were measured.
Results: Mean duration of diabetes was 8.5 years. Mean and SD of BMI, FBS, TG, Total cholesterol, HbA1C was 29.94±5.2 Kg/m^2, 181.21± 65.97 mg/dl, 179.6± 85.6 mg/dl, 204.74± 40.19 mg/dl, 8.68 ± 2.25 percent, respectively. Reported waist circumference and weight were correlated with measured waist circumference and weight in men (P= 0.002, P= 0.000) and women (P=0.000). This correlation remained significant even after adjustment for age and sex. Weight deviation was decreased with age increment (P= 0.02). Weight deviation and waist deviation were not correlated with FBS,2 hours

post prandial glucose, lipid Profile (Triglyceride, Total Cholestrol, LDL-c and HDL-c), HbA1C and Hemoglobin.
Conclusion: Self reported anthropometry was well correlated with measured ones. With age increment, self image could be realistic. In our study, self image was not correlated with glucose and lipid profile.

No conflict of interest

P-1516

Acute glycemic variation observed post oriented physical activities with type 1 diabetics in a diabetes education program

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Introduction: Insulin theraphy, adequate nutrition, regular physical exercises, self-care, social-psychological support and education are the treatments fundamental to health with diabetes type1. The aim was to verify the acute variation of the capillary glycemia after oriented physical activities under adjustment orientation with diabetes type1 people.
Methods: Sample: 40 diabetes type1 (age 7-58 [23±12] years, diabetes type1 8±7 years duration). Capillary glycemia was collected at the beginning and end of 20 classes (duration 110min). Adjustments were individually dealt with each person according with the beginning, considering interferential variables – nutrition, insulin action, medical orientations, personal experience with the attendant. Adjustments were suggested – carbohydrates or rapid-insulin – after an evaluation of the glycemic alteration tendency as a consequence of exercise and personal aspects. Glycemic values are classified in FA (<70mg/dl), FB (71-140mg/dl), FC (141-250mg/dl) and FD (>250mg/dl).
Results: In the 800 beginning measures, we found 5%–FA, 20%–FB, 52%–FC, 23%–FD. In end measures, after evaluation, adjustment procedures oriented physical exercises and intellectual activities when necessary: 15%–FA, 42%–FB, 38%–FC, 5%–FD. There's a line of central down tendency of 183±52 to 131±45mg/dl in relation to averages of beginning and end, showing also shorter amplitudes on the glycemic values. There's been 21% of increases (reduction of hypo) and 79% of glycemic decrease after exercises (considered maintenance <15%).
Conclusion: Actions focusing education on diabetes mellitus using variables of the own treatment as a means of training (adjustments in exercises, nutrition, insulin) were efficient to improve the glycemic control, be it in its acute form (after exercises) or in the long run.

No conflict of interest

FOUNDATION SCIENCE

Animal models of diabetes

P-1517

A strain of Otsuka Long-Evans Tokushima Fatty (OLETF) rat with a large subcutaneous adipose tissue (SAT) is resistant to develop diabetes

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Aims: OLETF rat is an animal model of type 2 diabetes. During ongoing research, we found that some of them became diabetic but others did not show diabetic feature though all OLETF rats became obese. We tried to find out the metabolic characteristics of these diabetes-resistant OLETF rats especially focusing on adipose tissue distribution, plasma adipocytokine levels as well as insulin resistance and beta cell function.
Methods: Twenty male OLETF rats have been kept in individual cages and have eaten standard rat chow and water freely. When they became thirty eight weeks old, we observed that some rats (n=10) did not develop diabetes while the others did. We measured fasting blood glucose (FBS), plasma insulin, HOMA-IR index, HOMA-beta % index, and adipocytokines from fresh blood samples and allocated blood samples which were already drawn for the ongoing research. We already had data about subcutaneous adipose tissue (SAT) and visceral adipose tissue (VAT) areas which were measured by computer tomography (CT) at twenty nine weeks old. We did urine sugar test with strip. We divided them into two groups as negative urine glucose (diabetes-resistant, DR) group and positive urine glucose (diabetes-prone, DP) group. We compared above parameters between groups at age of twenty nine weeks and thirty eight weeks.
Results: At the age of thirty eight weeks, FBS of DR group (147±23 mg/dL) was significantly lower than that of DP group (173±30 mg/dL) ($P<0.05$). Plasma insulin concentration (2.11±0.92 ng/mL vs. 1.24±0.56 ng/mL, $P<0.05$) and HOMA-beta % (125±60 vs. 65±36, $P<0.05$) of DR group were significantly higher than those of DP group. At the age of twenty nine weeks, SAT mass of DR group (18±2 cm^3) was significantly icreased than that of DP group (15±2 cm^3) ($P<0.05$), but the VAT mass did not show difference (72±2 cm^3 vs. 73±2 cm^3). The plasma insulin concentration (1.82±0.83 ng/mL vs. 2.91±1.34 ng/mL, $P<0.05$) and HOMA-IR index (16.03±6.37 vs. 26.27±11.35 $P<0.05$) of DR group were significantly decreased than those of DP group. There was no significant difference of plasma adipocytokines (leptin, adiponectin, interleukin, tumor necrosis factor a) between DR group and DP group.
Conclusion: A strain of diabetes-resistant OLETF rat showed more subcutaneous adipose tissue mass, less insulin resistance and more preserved insulin secretory function than diabetes-prone OLETF strain. We carefully suggest that a large mass of subcutaneous adipose tissue might prevent to develop diabetes independent of plasma leptin and adiponectin in a certain strain of OLETF rats.

No conflict of interest

P-1518

Diabetes abolishes the contraction-induced enhancement of GLUT4 expression in skeletal muscle participation of MEF2, GEF,TR-alpha and HIF-1a transcription factors

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GLUT4, the main glucose transporter found in skeletal muscle, has an essential importance to the maintenance of glycemic homeostasis. It is known physical exercise enhances this gene expression, improving insulin sensitivity. Furthermore, the contractile activity has a rapid enhancer effect upon GLUT4 expression.
Objective: The present work investigates whether the contractile activity-induced stimulation of the GLUT4 expression is preserved in soleus muscle of diabetic rats, and evaluates potential transcriptional factors involved.
Material and methods: Male Wistar rats were rendered diabetic, and 14 days later they were treated with NPH insulin 6U/day (DI) or saline (DS) for 7 days. Non-diabetic rats (ND) were also studied. At the end of treatment, right and left soleus muscles were removed and incubated in Krebs Hanseleit Buffer for acute "in vitro" contraction. The right soleus was electrically stimulated (supra-maximum stimulus: 100 Hz for 10 min.), and the left soleus (non-stimulated) was used as the correspondent control sample. The GLUT4 mRNA and protein were assayed by RT-PCR and Western Blotting respectively. The binding activity of the transcriptional factors myocyte enhancer factor 2 (MEF2), GLUT4 enhancer factor (GEF), hypoxia inducible factor-1a (HIF-1a), and thyroid hormone receptor-alpha (TR-alpha) were analyzed by Eletrophoretic mobility shift assay (EMSA).
Results: As expected, diabetic rats showed hyperglycemia and increased 24-hour urinary glucose, which was reversed by insulin treatment. The "in vitro" contractile activity was efficient in increasing the GLUT4 expression in ND (mRNA 30% and protein 100%, $P<0.05$) and DI (mRNA 20%, and protein 135%; $P<0.05$) rats, but had no effect in DS group. ND and DI rats increased ($P<0.05$) binding activity of the transcriptional factors MEF2 (~63%), GEF (~120%) and TR alpha (~100%). Furthermore, in ND rats, contraction also increased the HIF-1a (35%, $P<0.05$) binding activity. On the other hand, in muscles from DS rats, the contractile activity did not alter the binding activity of the transcriptional factors.
Conclusion: Soleus muscle from normal rats responded very well to contractile stimulus, enhancing GLUT4 expression. This effect seems to involve activation of MEF2, GEF, TR-alpha and HIF-1a transcriptional factors. Diabetes abolished the contractile-induced enhancement of GLUT4 expression, as well as the activation of the transcriptional factors. The insulin treatment restored the diabetes-induced effects. These results highlight the important role of basal insulin in the control of GLUT4 gene expression. Besides, this study points

out that, in diabetic subjects, the benefit of physical exercise upon the GLUT4 expression depends on good control of the metabolic state.

No conflict of interest

P-1519

Different insulinotropic effects of GLP-1 and GIP before and during an IVGTT under systemic DPP4 inhibition in Wistar rats

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Background: Data on insulinotropic potency of GLP-1 and GIP are controversial and systematic investigations are missing. We had performed glucose and insulin measurements in rats receiving placebo (P), 1, 2, 4 and 8 nmol/kg GIP and 4 and 8 nmol/kg b.w. GLP-1 5 min before an IVGTT. The GLP-1 dose of 4.0 nmol/kg produced an insulinotropic effect comparable to that of 2.0 nmol/kg GIP – I-$AUC_{0\text{-}25min}$: 179± 76* vs. 164±63* ng·min·ml^{-1}, insulinogenic Index (iI): 1.11±0.50* vs. 0.97±0.37* ng/mmol. The glucose efflux was less effective after GLP-1 administration. Since the generated data in the tests could be influenced by a) early insulin liberation and b) action of systemic DPP4 activity immediately after incretin injection and before IVGTT, the effects of both these components should be investigated more in detail.

Methods:

a. Catheterized Wistar rats were injected with P, 4.0 nmol/kg GLP-1 ((7-36) amide; Neo MPS; Strasbourg, France) and 2.0 nmol/kg GIP (Probiodrug AG, Halle/Saale, Germany). Incretins were dissolved in 0.1 % BSA in saline and were injected at 0 min. Arterial blood for blood glucose (BG) and plasma insulin (I) were taken (-5, 0 min and then at 1, 2, 3, 5, 7, 10, 15 and 20 min). Reactive (r) and absolute (a) G- and I- $AUC_{0\text{-}20min}$ was calculated.
b. The DPP4 inhibitor P32/98 was injected at -20 min (dose: 30 µmol/kg), the respective incretin at -5 min and the IVGTT (0.4 g glucose/kg) at ± 0 min. Blood sampling was extended to 60 min. G- and I- $AUC_{0\text{-}25min}$, iI (mg/mmol) and glucose efflux K_G (%/min) were calculated from IVGTT. To compare treatment groups with the control, the two-tailed t-test with Bonferroni-Holm correction was chosen, a *p<0.05 was considered significant.

Results:

a. Both GLP-1 and GIP induced an insulin increase under basal blood glucose –GLP-1: rI-AUC 10.6±6.0*, aI-AUC 16.9±4.1* ng·min·mL^{-1}; GIP: rI-AUC 8.8±3.4*, aI-AUC 16.5±4.7* ng·min·mL^{-1}. 33.9 % and 34.5 % of insulin increase occurred within 3 min in both the tests. rG-AUC was unchanged after GLP-1 vs. P (10.1±6.2 vs. 4.6±4.1 mmol·min·L^{-1}) but declined after GIP (-1.7±4.2 mmol·min·L^{-1}*).
b. DPP4 inhibitor declined always plasma DPP4 activity to 25-20 %. 2 nmol/kg GIP improved more efficient than 4 nmol/kg GLP-1 glucose tolerance (rG-AUC; GIP: 25±26, GLP-1: 65±30, P: 48±12; aG-AUC; GIP: 159±32.5*, GLP-1: 204±33, P: 184±17 mmol·min·$L^{-1)}$, insulin response (rI-AUC; GIP: 76±53, GLP-1: 62±19, P: 47±19; aI-AUC; GIP 140±41*, GLP-1: 71±25, P: 54±22 ng·min·mL^{-1}), iI (GIP: 0.88±0.19*; GLP-1: 0.34±0.10; P: 0.29±0.11 mg/mmol) and glucose efflux K_G (GIP: 22.0±5.5; GLP-1: 10.1±2.0*; P: 15.4±1.5 %/min).

Conclusions: Both 4 nmol/kg GLP-1 and 2 nmol/kg GIP induce an early insulin increase under basal conditions in healthy Wistar rats. Only the incretin GIP exerts a blood glucose decline. The plasma DPP4 activity on GLP-1 and GIP for a short time may not explain the different insulinotropic potency of GLP-1 and GIP in the IVGTT in rats and especially not the great difference in glucose efflux.

No conflict of interest

P-1520

Liraglutide but not vildagliptin restores normoglycemia in Psammomys obesus

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Psammomys obesus, or the sand rat, is a model of human type 2 diabetes because the development of diabetes resembles what is seen in humans, i.e. initial hyperinsulinemia concomitant with obesity and later hypoinsulinemia and hyperglycemia. We studied the effects of the GLP-1 analog liraglutide and the DPP4 inhibitor vildagliptin in sand rats.

One group of animals was maintained on low energy diet and seven groups were fed high energy diet (HED) that induced diabetes over a four week period. The diabetic animals were treated for 0, 6 or 14 days with vehicle, 0.2 mg/kg liraglutide twice daily subcutaneously or 30 mg/kg vildagliptin twice daily orally. This dose was demonstrated to decrease DPP4 activity to below 50% 18 hrs after the last dosing. Beta-cell mass (BCM) and proliferation- and apoptosis frequencies were determined using stereological point counting on sections stained for insulin, Nkx6.1, ki67 and tunel activity.

Liraglutide significantly reduced blood glucose (6 day vehicle:13.9 ± 1.8 mM vs. liraglutide:3.1 ± 0.2; 14 day vehicle:16.5 ± 1.2 vs. liraglutide:9.4 ± 2.1). Blood glucose was normalized in all 13 animals treated with liraglutide for 6 days and in 11 of 17 animals after 14 days treatment compared to none in any of the two control groups (n=12 and 14, respectively). HED increased BCM and treatment with liraglutide did not change this (LE:28.3 ± 4.5 mg/kg vs. 0 day:107.5 ± 28.7). There were no significant changes in proliferation frequency after treatment with liraglutide, but there was a tendency for decreased apoptosis frequency in the normalized, liraglutide-treated animals (6 days vehicle:0.013 ± 0.004% vs. liraglutide:0.006 ± 0.003; 14 days vehicle:0.022 ± 0.008 vs. liraglutide:0.009 ± 0.003). Pancreatic insulin content at 6 and 14 days was significantly higher in the normalized animals (P<0.05). Vildagliptin was not able to reduce blood glucose (6 days vildagliptin:16.4 ± 1.8 mM; 14 days vildagliptin: 19.3 ± 1.1), did not alter the HED induced increase in BCM, nor did it increase pancreatic insulin content.

These results suggest that liraglutide improved diabetes in sand rats partly by improving the function of the remaining islets. Vildagliptin did not improve the glycemic state in sand rats.

Conflict of interest:

Stock ownership: R. Scott Heller, Thóra B. Bodvarsdottir, Carsten F. Gotfredsen, Allan E. Karlsen, Lotte B. Knudsen- Novo Nordisk
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P-1521

The influence of diabetes on acetoaminophen® induced hepatotoxicity in wistar rats

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Introduction: Uncontrolled diabetes is associated with formation of ketone bodies, which are known to cause hepatotoxicity.

The aim of this study is to investigate the effect of experimentally induced diabetes on susceptibility to acetoaminophen hepatotoxicity.

Methods: Seventy eight adult albino wistar rats of 140-180 g body weight were divided into 4 main groups. Group I; untreated (control). Group II; received acetoaminophen® in oral doses of 50, 100, 150, or 300 mg/kg. Group III (experimental diabetes); two subgroups; one Injected by alloxan 10 mg/kg, s.c, the other injected by streptozotocin 150mg/kg, i.p. Group IV. diabetic rats were injected by acetoaminophen (150 mg/kg p.o). Their blood sugar was measured at day 14 following diabetogenic agent administration. And serum (ALT) was measured a day after acetoaminophen administration.

Results: Acetoaminophen was found to produce dose-dependent increase in the serum ALT levels, untreated (10±1.68), 50mg (9.59±7.07), 100mg (19.59±1.63), 150 (23.5±2.64), 200 (24.24±1.41), 300 (52.83±83). This effect is worsened in the diabetic status (Table 1)

Table. 1: Effect of co-treatment by acetoaminophen®on sALT levels in diabetic rats

No	Treatment Design	sALT Levels	
		Mean	±SE
1	Untreated (control)	10.82	0.53
2	Acetoaminophen®	23.50	1.10
3	Alloxan (All)	27.78	1.79
4	Streptozotocin (STZ)	18.66	0.39
5	Acetoaminophen® + Alloxan	46.78	0.34
6	Acetoaminophen® + Streptozotocin	59.10	0.50

*Significant at p value < 0.05 in comparison to untreated (control) rats OR
*Acetoaminophen alone (150 mg /kg)

Discussion: The experimental chemically induced diabetes either by alloxan or by streptozotocin produced significant elevation of serum ALT levels. Treatment by acetoaminophen® to those diabetic rats resulted in significant elevation in the serum ALT to much higher levels than those produced by experimental diabetes or by acetoaminophen® alone. This elevation in the serum ALT levels represents an additive effect in case of alloxan-diabetes and a potentiate effect in case of streptozotocin-diabetes.
We conclude that careful assessment of the interaction between experimental diabetes and hepatotoxic drugs should be highly considered. As this might have clinical implications.

No conflict of interest

P-1522

The effect of licorice root extract on blood sugar level in streptozotocin-induced diabetic rats

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Background and objective: Licorice is a herbal medicine which carries a lot of traditional effects as the root of this herb is very sweet in case of reducing blood sugar or can be used in treatment or feeding diabetic patients. Present study was performed to determine whether licorice could reduce blood sugar.
Materials and methods: This experimental study was done on eight (8) groups of matured male rats weighing 200 – 250g. Diabetes were established in five groups by injection of 55 mg/kg of streptozotocin. The rats with a blood sugar of higher than 250 mg/kg were entered in the study. Three groups of diabetic animals were fed- (100, 200, 300 mg/kg) by licorice extract, respectively per day- as follows: 1) through mouth and throut tubes for 35 days. 2). One group of the diabetic rats were injected by insulin NPH at a dose of 4 units and One group of the diabetics was considered without any special treatment. The Plasma level of the blood sugar of the rats were measured on zero, 7th, 14th, 21th and 35th days, respectively.
Results: This research showed that the dosage of 100 mg/kg had not affected blood sugar but dosage of 200 mg/kg during various days of the test (7, 14, 21, 35) had significantly decreased blood sugar. The dose of 300 mg/kg only could significantly decrease blood sugar on 7th and 35th days of treatment. During all various days with various dosage of licorice reduction of blood sugar was not observed as much as zero day.
Conclusion: Results show that extract of licorice roots had no change in healthy rats blood sugar but in diabetic rats the blood sugar was reduced so it can be concluded that extract of licorice roots can be probably used as a treatment or as a dietary sweetener for diabetic patients in clinical procedures.

No conflict of interest

Glucagon physiology and pathophsysiology

P-1523

Liver glucagon receptor binding properties: rapid changes with exercise and post-exercise

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The purpose of this study was to describe the effects of swimming exercise and post-exercise periods on liver glucagon receptor (GR) binding properties. Rats were randomly assigned to a rest control, a swimming exercise (90- and 180-min) and post-exercise (60- and 180-min) groups. Rats were sacrificed at the end of the exercise or the post-exercise periods, blood was sampled and liver was removed rapidly. Plasma membranes were purified from liver and saturation kinetics were obtained by incubation (10 mg of proteins/150 mL) with (^{125})I-labeled glucagon at concentrations ranging from 0.15 to 3.0 nM for 30 min at 30°C.
Results: No changes were observed with blood glucose during exercise and post-exercise periods, even if hepatic glycogen concentrations were significantly depleted with both exercise and post-exercise periods. Saturating curve analysis indicated higher glucagon receptor density with exercise reaching after 180 min: Bmax = 8.19 ± 0.29 pmol/pg of proteins vs 3.09 ± 0.53 pmol/pg of proteins in liver from resting control ($P < 0.05$). The glucagon receptor density decreased in post-exercise to reach 4.46 ± 1.75 pmol/pg of proteins after 180 min of post-exercise. Moderate changes in glucagon receptor affinity were also observed in the exercise and post-exercise groups compared to the control group (Kd at 180 min exercise and post-exercise: 0.46 ± 0.05 and 0.17 ± 0.01 vs 0.33 ± 0.05 nM in the rest control group). At the pancreatic hormone levels, these binding properties changes were associated with an increase in glucagon/insulin ratio of x2.8 and x8.7 during 90 and 180 min exercise periods and x9.3 and x2.7 after 60 and 180 min post-exercise periods vs the rest control group.
In conclusion, these results suggest that exercise and post-exercise episodes induced both changes in insulin and glucagon concentrations and rapid modification in glucagon receptor binding properties. Although the exact mechanisms remain unknown, there is no doubt that the liver adapts rapidly to exercise through modulation of GR binding characteristics. Funded by Natural Sciences and Engineering Research Council of Canada.

No conflict of interest

P-1524

The role of uncoupling protein 2 on secretory function of pancreatic islet a cell cultured in vitro

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Aims: Uncoupling protein (UCP) 2 negatively regulates insulin secretion, which is related to dysfunction of ß cell induced by fatty acids. The peroxisome proliferator-activated receptor-γ coactivator-1a (PGC-1a) may participate modulate UCP2 transcription. Recent studies showed that genipin, Gardenia extract, could inhibit UCP2. But the exact role of UCP2 on a cell is still not clear. So the aims of present study were to investigate the effects of UCP2 or its mediated oxidative stress on a cell function.
Methods: (1)The a TC1-6 cells were cultured in DMEM containing 25mM glucose, with palmitate or with palmitate and genipin for 72h. To evaluate the secretory function, cells were incubated in KRB containing 25mM or 2.8mM glucose for basal or stimulated secretion. (2)After cultured for 72h, the expression of UCP2, PGC-1a and glucagon were determined by RT-PCR and western. (3)RNA Interference (RNAi) duplexes corresponding to UCP2 were transfected into cells with Lipofectamine 2000. Cells were then incubated with palmitate for 72h. In the end of culture, secretory function study was carried out as described before. (4)The effect of RNAi on UCP2, PGC-1a and glucagon expression was measured after transfection by RT-PCR and western. (5) Nitrotyrosine in supernatant of each group was detected by ELISA.
Results: (1) After 72h culture, palmitate induced glucagon secretion increased significantly, while genipin improved it and made it close to the control. (2)At the same time, palmitate increased UCP2 mRNA expression by 45.3%, and genipin decreased the elevation by 32.2%. The change of PGC-1a mRNA expression had similar tendency as UCP2 did. However, there were no differences in levels of glucagon mRNA among three groups. (3) When interfere UCP2 expression by siRNA, glucagon release decreased markedly compared to that incubated with palmitate. Western confirmed the result. (4)The siRNA targeting UCP2 reduced the palmitate induced UCP2 mRNA expression. The expression of UCP2 in palmitate and siRNA interference group was 145.3% and 64.1% of control. PGC-1a mRNA expression also had similar tendency as UCP2 did. There were also no changes in glucagon mRNA expression after siRNA interference. Western confirmed the result. (5) Nitrotyrosine in supernatant of cell cultured with palmitate elevated significantly. There was no difference when intervented with genipin, while si-UCP2 improved the elevation of nitrotyrosine.
Conclusion: Chronic exposure of fatty acid on a cell stimulated glucagon secretion, and the treatment with genipin or siRNA targeting UCP2 expression could partly improve glucagon secretion. We speculated that overexpresion of UCP2 but not oxidative stress played an important role in a cell secretory dysfunction induced by fatty acid.

No conflict of interest

P-1525

The evaluation of possible roles of hormones other than insulin in the development of type 2 diabetes mellitus

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Insulin resistance plays major role in etiopathogenesis of type 2 diabetes mellitus. Increasing evidence suggests that glucagon and growth hormone (GH) may play role in development and progression of type 2 diabetes. The aim of our study is to evaluate the possible roles of glucagon, growth hormone and IGF-1, to show that type 2 diabetes mellitus is not only a beta cell dysfunction but also develops as a result of failure of all endocrine pancreas and to identify what the roles of pathologic changes in growth hormone and glucagon secretion are in the development of diabetes. An oral glucose tolerance test (OGTT) was performed for all adults conducted for this study. GH, Glucagon and insulin were measured at minutes of 0, 60, 120 and basal IGF-1 was measured also. Participants divided into four groups according to the results of OGTT as diabetes, impaired fasting glucose (IFG), impaired glucose tolerance (IGT) and control group.
Insulin resistance which was calculated as HOMA-IR score was significiantly higher compared to participants with normal glucose tolerance (NGT) in those with abnormal glucose tolerance. Plasma IGF-1 levels were significantly lower (p<0,05) in participants with abnormal glucose tolerance compared to participants in control group.
Area under curve calculated for insulin was significantly higher in subjects with IFG (p<0,05). There was significant difference between subjects with IGT and NGT, there was no difference between diabetic subjects and NGT. Area under curve calculated for glucagon was significantly higher in participants with IGT, IFG and diabetes compared to participants with NGT (p<0,05). There was no difference between IGT, IFG and diabetic group. Area under curve calculated for GH was significantly higher in participants with IGT compared to participants with IFG, DM and NGT (p<0,05).
As a conclusion hyperinsulinemia is an absolute finding in subjects with prediabetes but diabetes develops as a consequence of decreased insulin secretion. In spite of the different levels of insulin in prediabetes and diabetes, hyperglucagonemia can be seen also in both diabetic and prediabetic subjects. Hyperglucagonemia may play an important role in progression to diabetes. Low plasma concentrations of IGF-1 in diabetic and prediabetic subjects may be a result of GH resistance as shown in previous studies. The significantly higher values of area under curve of GH in subjects with IFG may indicate that IFG can be an original subgroup and the hypersecretion of GH can be the cause of fasting hyperglycemia.

No conflict of interest

Insulin insensitivity and the metabolic syndrome

P-1526

Comparative evaluation of the performance characteristics of adiponectin, HDL-cholesterol and triglycerides as markers of the metabolic syndrome

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First-degree relatives (FDR) of patients with type 2 diabetes (T2DM) have increased risk of developing diabetes because of aggregation of cardiometabolic risk factors. This study explores the potential use of adiponectin as a marker of the metabolic syndrome (MS) in normoglycemic FDR of T2DM patients. Fasting adiponectin, insulin, glucose, and full lipid profile were determined in 423 and 53 healthy control subjects without family history of diabetes. Clinical and anthropometric data were recorded and subjects were classified on the basis of the degree of adiposity, insulin resistance (IR) (HOMA-IR) and the number of criteria of the MS (International Diabetes Federation). Adiponectin concentration was higher in females than males (mean 9.7 vs. 6.9 ug/ml) despite similar waist circumference (WC). In both FDR and controls, adiponectin was inversely correlated with WC and HOMA-IR and positively correlated with HDL-cholesterol (HDLC). Adiponectin showed stepwise decrease with increasing number of MS criteria. Binary logistic regression showed that the odds ratio of MS as predicted by adiponectin was 0.55 [95% confidence interval 0.41-0.73; p < 0.0001]. At cut-off points of 7.5 ug/ml, the diagnostic sensitivity and specificity of adiponectin for the MS were 90% and 70% respectively compared to 42% and 95% for triglycerides and 80% and 54% for HDLC at standard cut-off points. Receiver Operating Characteristic analysis showed that adiponectin (0.859) had significantly higher area under the curve compared with HDLC (0.745) and triglycerides (0.823) for detection of MS. Adiponectin has superior diagnostic performance characteristics compared to the ubiquitously used TG and HDLC for the identification of subjects with MS.

Conflict of interest:

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P-1527

Differential effect of metformin therapy and intensive lifestyle intervention on metabolic syndrome (MS) among young women with polycystic ovarian syndrome (PCOS)

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Metabolic Syndrome (MS) with polycystic ovary syndrome (PCOS) is a high risk state for DM and cardiovascular disorders. Insulin sensitizers can potentially delay the development of these complications. MS in PCOS is a potentially reversible insulin resistance endocrinopathy.
Aim: To identify the role of life-style modification and/or metformin therapy in young women with PCOS with or without features of MS.
Methods: 312 women fulfilling the Rotterdam consensus criteria (2003) of PCOS were recruited from the Gynecology and Endocrinology outpatient clinics, Mansoura University Hospital. They were grouped into group (A) without MS (n=190), and group (B) cases who fulfilled the definition criteria of MS (n=122), according to the National Cholesterol Education Program - Modified Adult Treatment Panel III (2001). All cases underwent clinical assessment and anthropometric measurements, as well as cardiovascular evaluation in the form of resting ECG, Echocardiography and Carotid intimal medial thickness (CIMT) by ultrasound doppler study, both before and 1-year after a therapeutic intervention. Each group of cases were randomly divided into 4 subgroups that were assigned to receive one of four treatment protocols after obtaining an informed consent: life-style modification (diet and physical activity), metformin therapy (500 mg tds), combined life-style modification and metformin therapy or placebo. Components of the MS as well as the cardiovascular risk data before and at the end of the therapeutic intervention were compared.
Results: The protocol of combined life-style modification and metformin therapy was the best in ameliorating the components of MS as 80% of MS cases lost their definition criteria of the syndrome after the treatment period. Life-style modification alone was effective in 51.6% of cases, while isolated Metformin therapy protocol ameliorated MS features in only 24%. In the placebo group, the definition MS progressed significantly from afflicting 38.5% to become afflicting 48.5% cases after the study period (P <0.001). Significant decrease in QT dispersion was noticeable only in the protocol of combined life-style modification and metformin therapy (P 0.031), while the interventricular septum diameter as well ad CIMT did not show significant change with any of the therapeutic protocols over the study period.
Conclusion: Therapeutic intervention with life style modification and/or metformin may be effective in prevention and amelioration of the MS as well as in halting the progression of cardiovascular risks in PCOS women. A combined intervention of both modes of therapy is far more effective than any of them alone.

No conflict of interest

P-1528

Insulin secretion and insulin sensitivity in the pathogenesis of the onset and deterioration of impaired glucose regulation in Chinese subjects

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Aims: Impaired glucose regulation (IGR) represents an intermediate stage between normal glucose tolerance (NGT) and diabetes. However, the insulin secretion and sensitivity in the pathogenesis of the onset and deterioration of IGR remain unclear. The study was to investigate the insulin secretory dysfunction and insulin resistance in the pathogenesis of the onset and deterioration of impaired fasting glucose (I-IFG) and isolated impaired glucose tolerance (I-IGT) in Chinese subjects.

Methods We studied 4486 NGT, 91 I-IFG and 489 I-IGT subjects from 1998 to 2001 in Shanghai, which includes 75-g OGTT, insulin release test and anthropometrical measurements. We conducted a follow-up study from 2002 to 2004 in the same population. In the subgroup of the study, hyperglycemic clamp technique was performed in 32 NGT, 17 I-IFG and 15 I-IGT subjects. The study was to determine the insulin sensitivity and insulin secretion in the pathogenesis of their onset and deterioration to diabetes.

Results:

1. Compared with NGT, both I-IFG and I-IGT had significantly lower first-phase insulin release (1PH), second-phase insulin release (2PH), insulin sensitivity index calculated by Cederholm formula (ISIc) and higher HOMA-IR (P<0.01-0.05). All the parameters of insulin sensitivity and secretion except 1PH had significant differences between I-IFG and I-IGT (all P<0.05). 2PH, ISIc and HOMA-IR of I-IGT were lower than those of I-IFG. HOMA-%B of I-IFG was lower than that of NGR while that of I-IGT was not.
2. In the deterioration to diabetes, Stumvoll estimated first-phase insulin release (Stumvoll 1st), second-phase insulin release (Stumvoll 2nd) and ISIc of both I-IFG and I-IGT were significantly reduced. HOMA-IR of both I-IFG and I-IGT was significantly enhanced. Notably, the descending degrees of Stumvoll 2nd and ISIc in I-IFG were significantly larger than those of I-IGT (28.30% vs. 18.62% and 29.81% vs. 17.56%, all P<0.05). HOMA-%B of I-IFG was significantly reduced while that of I-IGT was not.

Conclusion:

1 Since first-phase insulin responses were similarly reduced in I-IFG and I-IGT, we conclude that I-IFG mainly results from impaired basal insulin secretion and hepatic insulin resistance whereas I-IGT mainly results from reduced second-phase insulin release and peripheral insulin resistance.

2 In the deterioration to diabetes, the first and second phase insulin secretion as well as the hepatic and peripheral insulin sensitivity of I-IFG and I-IGT all continue to decline. Moreover, the decreasing degrees of second-phase insulin secretion and peripheral insulin sensitivity in I-IFG are larger than I-IGT. The basal insulin secretion of I-IFG was also significantly decreased.

No conflict of interest

P-1529

Hepatic antioxidant system response to a fructose-rich diet

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Aim: To study the changes induced in the hepatic antioxidant system by administration of fructose-rich diet.

Materials and methods: Normal male Wistar rats were fed with commercial diet and tap water (C) or the same diet plus 10% fructose in the drinking water (F) for 21 days. Thereafter, glycemia (G) (GOD-PAP), triglyceridemia (TG) (commercial kit), insulinemia (In) (RIA), HOMA-R (insulin resistance indicator) were measured and an intraperitoneal glucose load (IGL) was performed. After liver removal, we measured: 1) content of thiobarbituric acid reactive substances (TBARS) and reduced glutathion (GSH) (spectrophotometry); 2) mRNA (qPCR), protein expression (Western blot) and enzymatic activity (spectrophotometry) of superoxide dismutase (SOD), catalase (CAT) and glutathion peroxidase (GPx); 3) hepatic microsomal susceptibility to enzymatic and non enzymatic-induced lipid peroxidation, and 4) triglyceride content (TGC).

Results: (means ± SEM; F vs. C): G 8.3 ± 0.2 vs. 7.2 ± 0.3 mM, p<0.005; TG 1.3 ± 0.1 vs. 0.8 ± 0.1 mM, p<0.001; In 4.7 ± 0.6 vs. 2.7 ± 0.5 ng/ml, p<0.02; HOMA-R 43 ± 3 vs. 26 ± 2, p<0.001; IGL (AUC) 4.31 ± 0.5 vs.1.57 ± 0.63 mM glucose/min, p < 0.01; TGC 379.7 ± 53.4 vs. 207.5 ± 12 µg TG/100 mg protein, p<0.01; GSH 3.2 ± 0.26 vs. 4.2 ± 0.28 µmol/g tissue, p<0.05; no significant changes were measured in hepatic TBARS levels. The genic expression of CAT, SOD and GPx was 43 ± 9 vs. 100 ± 5%, p<0.001; 28 ± 7 vs. 100 ± 22%, p<0.01; 51 ± 15 vs. 100 ± 4%, p<0.01, respectively. Protein levels (Western blot) of CAT, SOD and GPx were 79 ± 6 vs. 100 ± 3%, p<0.02; 70 ± 8 vs. 100 ± 2%, p<0.003, with no changes for GPx. Only CAT activity showed a significant reduction (15%, p<0.05). No significant differences were recorded in hepatic microsomal susceptibility to lipid peroxidation between C and F rats.

Conclusions: High fructose feeding induces significant hormonal and metabolic changes accompanied by a decrease in the hepatic antioxidant system; in the period studied, however, these changes did not affect the peroxidation level of liver membrane lipids.

No conflict of interest

P-1530

Concomitant modulation of transcripts related to fiber type determination and energy metabolism in skeletal muscle by estradiol injection

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Aims: In postmenopausal women, prevalence of metabolic syndrome (MS) is 40%. Aging is also associated with a decline in basal metabolic rate (BMR) and an alteration in tissue metabolism which in turn leads to MS. The skeletal muscle, an insulin-sensitive tissue, accounts for more than 30% of the BMR. Thus a loss in skeletal muscle mass by aging (sarcopenia) widely affects MS. Hormonal replacement therapy (HRT) is commonly prescribed for symptoms of menopause and can improve many components of MS in this population such as abdominal obesity, insulin resistance and blood pressure. However, the effects of HRT on sarcopenia and skeletal muscle metabolism still remain unclear.

Methods: In order to characterize the specific effects of HRT in skeletal muscle, we have analyzed the effects of estradiol (E_2) on global gene expression in skeletal muscle of ovariectomized (OVX) female mice by using the serial analysis gene expression (SAGE) method. Animals were randomly assigned to six different groups: the vehicle group (OVX), and five groups of mice in which a single physiological dose of E_2 was injected 1, 3, 6, 18 or 24 h prior to the sacrifice. Data was confirmed by Q_RT-PCR.

Results: E_2 injection modulated 177 transcripts, including 11 partially characterized transcripts and 52 potentially novel transcripts. In the early response to E_2 ($E_2$3h), most of the differentially expressed transcripts were up-regulated and were related to oxidative phosphorylation and mitochondrial ATP synthesis. On the other hand, most of the late responsive ($E_2$24h) transcripts were down-regulated, and were related to fast type skeletal muscle determination, sugar, lipid and amino acid metabolisms as well as oxidative phosphorylation and mitochondrial ATP synthesis. Specific transcripts, related to insulin sensitivity, insulin signaling and glucose transport were down-regulated at 24 h. The changes in total SAGE tag number of fast type-related transcripts coincided with changes in metabolic-related transcripts.

Conclusion: These results demonstrate that a single physiological dose of E_2 can modulate concomitantly transcripts determining skeletal muscle type, structure and growth and energy metabolism, which may in turn affect sarcopenia and MS.

No conflict of interest

P-1531

Cardiovascular status and metabolic syndrome (MS) among young women with polycystic ovarian syndrome (PCOS) in a rural area In Egypt

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Background: Women with polycystic ovarian syndrome (PCOS) have many features of metabolic syndrome where coronary heart disease may be increased. On the other hand, androgen excess is associated with premature atherosclerosis in women with PCOS with or without MS.
Objective: To evaluate the cardiovascular status and risk factors among active non smoker young PCOS women, in a rural community in Egypt, with or without features of MS.
Methods: 312 PCOS women were recruited from the Gynecology and Endocrinology Outpatient Clinics, Mansoura University Hospitals fulfilling the Rotterdam consensus criteria (2003) of PCOS. They comprised 122 women who fulfilled the definition criteria of MS according to the National Cholesterol Education Program - the Modified Adult Treatment Panel III (NCEP- ATP III panel, 2001). The remaining 187 cases did not fulfill the definition criteria (non-MS PCOS). A healthy age-matched control group of 50 women free of PCOS were also included in the study. All cases and control underwent ECG-QTc interval analysis, echocardiography for interventricular septal diameter (IVSD) and Ejection fraction (EF) estimation, and carotid intimal medial thickness (CIMT) by ultrasound Doppler study.
Results: Cardiovascular abnormalities were significantly higher among the MS PCOS cases compared to non-MS PCOS: significant prolongation of QTc interval (P 0.03) with evident QT dispersion (P 0.01), significant increase in IVSD (P 0.03), significant decrease in EF (P 0.01) and significant increase in CIMT (P 0.04) in PCOS cases with MS. On the other hand, the non-MS PCOS cases showed nonsignificant prolongation of QTc interval (P 0.07), significant increase in IVSD (P 0.01) nonsignificant decrease in EF (P 0.09) and significant increase in CIMT (P 0.02) when compared to the healthy control women.
Conclusion: Many cardiovascular risks are frequent and evidence of premature atherosclerosis is existent among young women with PCOS, being even more exaggerated if there is associated MS. Early intervention to ameliorate cardiovascular risks for these cases is an important health care demand.

No conflict of interest

P-1532

Increased C-reactive protein concentration correlates with cumulative effects of metabolic syndrome components in people of the Inner Mongolia region

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Objective: To investigate the association between C-reactive protein (CRP) concentrations and individual metabolic syndrome (MetS) components and their accumulation in individuals from agricultural regions of Inner Mongolia, China
Methods: A cross-sectional survey was conducted in Tongliao City in Inner Mongolia between August 2003 and August 2004. A total of 2 536 participants, aged 20 or more, completed the survey and examination. Lifestyle risk factors were analyzed, as well as body weight, height, waistline, hipline, blood pressure, fasting plasma glucose, blood lipids, and CRP expression. MetS criteria were in accordance with the new International Diabetes Federation (IDF) definition.
Overall and gender-specific prevalence of MetS, and its individual components, were estimated, and chi-square test was used to compare categorical data. Odds ratios (95% CIs) of different CRP levels for the prevalence of individual MetS components were calculated using binomial logistic regression. And the cumulative odds ratios (95% CIs) of the various CRP levels for accumulation of number of MetS components were estimated using ordinal logistic regression analyses. The cumulative odds model was adopted for ordinal logistic regression analyses.
Results: According to the IDF criteria for MetS, the age standardized prevalence of MetS was calculated to be 16.3%. CRP levels were significantly higher in subjects with each MetS characteristic, compared to subjects lacking the corresponding MetS components both in men and women. The result of the binomial logistic regression showed that compared to the lowest CRP quartile, the adjusted ORs of 4th quartile CRP were statistically significant for all MetS components in both genders (all P-values = 0.001).
The age and smoking adjusted geometric means of CRP concentration for those with 0, 1, 2, 3, 4, and 5 components of the metabolic syndrome was 0.72, 0.79, 0.88, 0.98, 0.99, and 1.05 mg/L in men, and 0.63, 0.65, 0.75, 0.85, 0.99, and 1.08 mg/L in women respectively. There was a strong linear increase in ln CRP compared to the increasing number of MetS components (P-trend < 0.001).
Compared to the lowest CRP quartile, the age and smoking adjusted cumulative ORs values (95% CIs) of 2nd quartile CRP, 3rd quartile CRP and 4th quartile CRP were 0.96 (0.69,1.32), 2.35 (1.70,3.25), and 5.57 (3.99,7.79) in men, and 1.39 (1.07,1.82), 2.54 (1.93,3.33), and 6.11 (4.60,8.12) in women.
Conclusion: A significant and dependent association existed between increased CRP concentrations, individual MetS components, and MetS component accumulation in people from the Inner Mongolia region of China.

No conflict of interest

P-1533

High-sensitive C reactive protein-to-adiponectin ratio in IFG patients with and without acanthosis nigricans

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Background and aims: Acanthosis nigricans (AN) is often associated with hyperinsulinemia and may indicate increased risk of type 2 DM.
The aims of our study were to estimate the insulin resistance, to assess plasma high-sensitive C reactive protein (hs-CRP)-to-adiponectin ratio and proinflammatory state in IFG patients with and without AN.
Material and methods: The study enrolled 142 subjects with IFG, 58 men (40.8%) and 84 women (59.2%), with the mean age 46.7 ± 7.5 years. The IFG was defined according to the WHO criteria. Five locations were examined for AN diagnosis: the neck, axilla, elbows, knuckles and knees. In these patients we assessed plasma hs-CRP-to-adiponectin ratio, interleukin 6 (IL-6), tumor necrosis factor a (TNF-a), leptin and HOMA-IR. Linear relationships between key variables were tested by Pearson's correlation coefficient.
Results: AN was present in 21 patients (14.7%) with IFG. The prevalence of AN was higher in women (16.6%) than in men (12.1%). Plasma hs-CRP-to-adiponectin ratio was significantly higher in IFG patients with AN (0.88±0.17) than in IFG patients without AN (0.35±0.09), p < 0.001. In patients with AN adiponectin was negatively correlated with body mass index (BMI), waist to hip ratio (WHR), leptin, IL-6, TNF-a and hs-CRP.

Table 1. Hs-CRP-to-adiponectin ratio, insulin resistance and proinflammatory state in IFG patients with and without AN

IFG	AN	Without AN	p
Number (M/F)	7/14	51/70	-
hs-CRP-to-adiponectin ratio	0.88±0.17	0.35±0.09	p < 0.001
Adiponectin (µg/mL)	6.4±0.6	9.5±2.1	p < 0.001
Leptin (ng/mL)	11.2±3.4	8.3±1.3	p < 0.001
TNF-a (pg/mL)	9.3±1.7	7.2±1.6	p < 0.001
IL-6 (pg/mL)	4.7±0.9	3.2±0.4	p < 0.001
hs-CRP (mg/L)	5.6±1.3	3.3±0.7	p < 0.001
HOMA-IR	5.3±0.9	3.1±0.6	p < 0.001
Data are mean ± SD. p was calculated with unpaired Student's t test.			

Conclusions: AN is independently associated with insulin resistance and therefore may be useful as an early indicator of high risk for diabetes. Increased hs-CRP-to-adiponectin ratio and plasma concentrations of acute-phase proteins are present in adult patients with IFG and AN, and may contribute to promoting

the progression of IFG to type 2 DM. Detection of AN may help clinicians more rapidly identify high-risk individuals for diabetes counseling.

No conflict of interest

P-1534

Effect of antihypertensive and hypolipidemic treatment on plasma levels of leptin and adiponectin in patients with type 2 diabetes six month after the initiation of insulin therapy

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Aim: The aim of our study was to investigate the possible effect of antihypertensive and hypolipidemic drug treatment on plasma levels of leptin and adiponectin in patients with type 2 diabetes 6 months after the initiation of insulin therapy.

Patients and methods: This was an open-label prospective study of 6-month duration. A total of 45 insulin naïve type 2 diabetic patients (26 men, mean age= 64,7 ± 9,8 years, mean diabetes duration=12,2±6,9 years) from our Diabetes Outpatient Clinic were enrolled for this study and followed for 6 months after initiating insulin therapy. Blood pressure, weight, body mass index (BMI) and waist circumference were recorded for each patient. HbA_{1c} and lipid panels were measured by the standard procedures. Plasma concentrations of leptin and adiponectin were determined using commercially available radioimmunoassay kits (Linco Research).

Results:

Variables	Baseline	6 months	p
Hba1c (%)	9,98±1,7	6,9±1,5	<0,001
Weight (Kg)	72,3±16,5	76,1±17,6	<0,001
BMI (Kg/m²)	26,7±5,6	28,1±5,9	<0,001
Waist circumference (cm)	96,3±14,4	99,7±14,6	0,001
Total cholesterol (mg/dl)	205,3±43,1	192,9±51,9	0,009
Triglycerides (mg/dl)	187,5±119,6	139,9±67,7	0,001
Leptin (ng/ml)	10,44±8,57	15,92±11,75	<0,001
Adiponectin (μg/ml)	13,34±8,59	17,85±11,41	0,027

Plasma levels of leptin and adiponectin were significantly increased six months after the initiation of insulin therapy (10,44±8,57 vs. 15,92±11,75 p<0,001 and 13,34±8,59 vs. 17,85±11,41 p=0,027 respectively). However, these changes did not differ significantly between patients taking or not antihypertensive or hypolipidemic drug therapy. Furthermore, plasma levels of leptin and adiponectin did not correlate with either systolic or diastolic blood pressure at baseline and after 6 months.

On the contrary, leptin was positively correlated with BMI, weight, waist circumference, total cholesterol and HDL cholesterol, whereas adiponectin was negatively correlated with BMI, weight, waist circumference and LDL cholesterol (p<0,05 and rho>0,3 for all correlations).

Conclusion: In insulin naïve patients with type 2 diabetes, 6 months after the initiation of insulin therapy, leptin and adiponectin levels were significantly elevated.

In the present study, antihypertensive and hypolipidemic treatment did not seem to affect the observed changes in the levels of leptin and adiponectin.

No conflict of interest

P-1535

Changes in body weight and plasma levels of leptin, ghrelin and neuropeptide Y in patients with type 2 diabetes six months after the initiation of insulin therapy

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Aim: The aim of our study was to assess changes in body weight and plasma levels of leptin, ghrelin and neuropeptide Y (NPY) in patients with type 2 diabetes 6 months after the initiation of insulin therapy and to investigate possible correlations between them, in order to determine potential causes of weight gain.

Patients and methods: This was an open-label prospective study of 6-month duration. A total of 45 insulin naïve type 2 diabetic patients (26 men; mean age= 64,7 ± 9,8 years; mean diabetes duration=12,2±6,9 years) from our Diabetes Outpatient Clinic were enrolled for this study and followed for 6 months after initiating insulin therapy. Body mass index (BMI), weight, waist circumference and HbA_{1c} were recorded for each patient. The percentage of body fat was measured using bioimpendance analysis. Plasma concentrations of leptin, ghrelin and NPY were determined using commercially available radioimmunoassay kits (Linco Research and EURO RIA).

Results:

Variables	Baseline	6 months	p
HbA1c (%)	9,98±1,7	6,9±1,5	<0,001
Weight (Kg)	72,3±16,5	76,1±17,6	<0,001
BMI (Kg/m²)	26,7±5,6	28,1±5,9	<0,001
Waist circumference (cm)	96,3±14,4	99,7±14,6	0,001
Body fat (%)	35,7±9,5	37,4±11,9	ns
Leptin (ng/ml)	10,44±8,57	15,92±11,75	<0,001
Ghrelin (μg/ml)	907,39±269,58	833,88±293,48	ns
NPY (pmol/L)	170,82±64,6	89,35±30,52	<0,001

The only significant correlations observed were between changes in leptin levels and body weight, BMI and waist circumference.

Conclusion: In insulin naïve patients with type 2 diabetes, 6 months after the initiation of insulin therapy, leptin levels, body weight, BMI and waist circumference were significantly elevated, whereas NPY levels and HbA1c were significantly reduced. Our results show that although there was an increase in the levels of anorexigenic leptin in addition to a reduction in the levels of orexigenic NPY, patients' body weight increased.

No conflict of interest

P-1536

MSG-induced obesity in spontaneously hypertensive rats: An animal model characterized by clustering of cardiovascular disease risk factors

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Background: Monosodium glutamate (MSG) treatment of spontaneously hypertensive rats (SHR) in the neonatal period can generate characteristics of the metabolic syndrome, but the full animal model characterization was not studied yet.

Aims: To characterize the animal model of metabolic syndrome in MSG-treated SHR (anthropometric variables, inflammatory, metabolic and hemodynamic profile).

Methods: Male newborn SHR rats (n=48) were treated with MSG (MSG), 5mg/g subcutaneously/9 days, or saline (C). In 3-, 6- and 9-month old rats

we investigate: 1) anthopometry (body weight, length, Lee index); 2. glucose disappearance constant (kITT) during the insulin tolerance test (0.75 U/kg, EV); 2) cardiovascular evaluation (catheters were implanted into the femoral artery to measure arterial pressure (AP) and heart rate (HR) on a beat-to-beat basis in conscious animals one day later - Windaq/CODAS); 3) inflammatory markers (TNF-a; C-reactive-protein, CRP; interleukin-6, IL-6; adiponectin - ELISA) and lipid profile (total and HDL cholesterol, triglycerides). Normotensive Wistar-Kyoto rats (WKY) (n=16) were also studied, to compare cardiovascular data.

Results: As compared to C, MSG-treated rats presented higher Lee Index and insulin resistance at all ages, and hypertriglyceridemia and low HDL cholesterol at 6 and 9 ($p<0.05$) months. At 6 months, CRP (370 ± 20 vs. 201 ± 21 mg/mL), IL-6 (75 ± 11 vs. 36 ± 3 mg/mL) and TNF-a (12 ± 2 vs. 8 ± 2 pg/mL) were higher ($p<0.001$) in MSG vs C, and similar results were obtained at 9 months. Adiponectin was similar between groups, except at 9 months (0.32 ± 0.02 vs. 0.42 ± 0.02 mg/mL), when it was lower in MSG ($p<0.001$). Mean AP was higher in MSG and C (159 ± 14 mmHg and 148 ± 16 mmHg) as compared to WKY (112 ± 7 mmHg) at 3 months, p<0,001. Similar results were observed at 6 and 9 months (p<0,001).

Conclusions: The characteristics observed in the MSG-induced obesity in SHR confirms the clustering of cardiovascular risk factors in this animal model, making it useful for investigating potential treatments of the metabolic syndrome.

No conflict of interest

P-1537

Prevalence of the metabolic syndrome in patients with type 2 Diabetes: "X in T2DM"

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Introduction and aim: The increasing prevalence of type 2 diabetes (T2DM) proportionately increases the cardiovascular risk of the general population. Existence of the cluster of metabolic syndrome, with its element of insulin resistance, could significantly increase this further. The introduction of General Medical Service contract in UK has recently improved the quality of care provided to patients with diabetes in the community, especially with respect to achieving risk factor targets and increased use of statin and anti hypertensive medications. The aim of our study was to assess the presence of metabolic syndrome across our diabetic population on a cross sectional study, using the IDF criteria for establishing the diagnosis.

Methods: Data was collected on patients with T2DM from our computer database registry. Any patient who is currently under annual review, either at hospital or with the primary care physician, was included in the study. Any patient with T2DM for less than a year, or in whom the type of diabetes was debated, was excluded. Metabolic syndrome was diagnosed by using waist circumference ≥94cm for men and ≥80cm for women as essential criteria and presence of one of the following 3 (as all patients had T2DM)

- Reduced HDL cholesterol: <1.03 mmol/L in males and <1.29mmol/L in females or on specific treatment for this lipid abnormality
- Raised Triglycerides (TGL): ≥1.7mmol/L or specific treatment
- Raised BP: systolic BP ≥130 or diastolic ≥85 mm Hg or on treatment

Results: A total of 4495 patients were included in the registry. Only 3683 could be included in study based on the essential anthropometric criteria. 55% were men. The mean duration of diabetes was 7.4 years (1-57 years), average age being 64.8 years and age of onset 57.4 yrs (11-92 years). The mean HbA1c was 7.3%, BP 136/76 and total cholesterol 4.2mmol/L

92% of the patients had features of metabolic syndrome, with 67% having more than one criterion and 26.7% having all the 3 criteria. The distribution was not different between the sexes (92% men, 92.7% women). The predominant contributor was high blood pressure (prevalence 77.5%), followed by low HDL (61%) and high TGL (55.1%)

Conclusion: Although the glycaemic control appears satisfactory, the prevalence of the components of metabolic syndrome is significantly high in patients with T2DM in our study. Various cardiovascular risk factors are inadequately controlled in spite of a significant increase in use of multiple pharmacological agents. An aggressive approach is required to treat blood pressure and lipids to desired targets in this high risk population, to prevent cardiovascular events.

No conflict of interest

P-1538

Effects of exogenous insulin intervention on insulin signaling pathway in the liver of diabetic mice determined by gene micro array

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Background and aims: Insulin resistance in the liver is one of the main defects in type 2 diabetes. Indeed, post receptor changes in insulin signaling are at the core of insulin resistance. In the setting of insulin resistance, insulin action of metabolic (PI3K) and mitogenic (SHC/MAPK) pathways are differently affected. We explored the effects of exogenous insulin intervention on insulin signal pathway in the liver tissue, using gene micro array to investigate significant changes in hepatic gene transcription after insulin intervention.

Materials and methods: 30 5-week-old C57BL/6 mice were randomized into 3 groups: A, fed with normal diet (9.9% calorie from fat); B and C, fed with high fat diet (60% calorie from fat). After 12 weeks fed, mice in group C were injected with insulin glargine s.c. at 0.5IU. Mice in group A and B were injected with saline s.c. at 0.5ml. The intervention lasted for 4 weeks. After that, the mice were executed and the livers were frozen for mRNA extraction. The mRNA expression of 100 target genes involved in insulin signaling pathway were determined by gene micro array.

Results: If the mRNA expression in Group A was 100%, the expression of genes involved in the insulin signaling pathway of Group B and C were as follow: 1) Akt-2 26% and 63%; Akt-3 17% and 71%; Pik3r2 241% and 97%; Ptpn1 293% and 143%; 2) Cap1 38.77% and 63.60%; Cbl 34.48% and 67.85%; Crk-I 27.49 and 36.06%; 3) Shc3 526.8% and 260.6%; Sos1 203.0% and 79.29% respectively.

Disccusion: 1) Insulin resistance in diabetes was mediated by reduced PI3K as well as Cbl and CAP signaling pathway. Exogenous insulin improved PI3K signaling by up-regulation of Akt-2 and Akt-3 and down-regulation of Pik3r2 and Ptpn1. While Cbl and CAP signaling were not significantly improved because the expression of Cap1, Cbl, and Crk-I were not significantly increased by insulin intervention. 2) In the setting of insulin resistance, the SHC/MAPK pathway shifts the balance in favor of the mitogenic actions. Expression of Shc3 and Sos1 were significantly increased in high fat induced diabetic mice. It was likely that sustained activation of the MAPK pathway occurred via SHC activation. After insulin intervention, Shc3 and Sos1 were obviously down regulated suggesting exogenous insulin did not aggravate insulin action of mitogenic pathway.

Conclusion: High fat diet could impair insulin action of metabolic signaling pathway by affecting gene expression of Akt-3, Akt-2, Pik3r2, Ptpn1, Cap1, Cbl and Crk-I. After 4 weeks of insulin intervention, such defects were partially alleviated. In high fat induced diabetic mice, SHC/MAPK signaling pathway might be activated due to the up-regulated expression of Shc3 and Sos1. Insulin intervention down regulated these genes illuminating that systemic use of exogenous insulin might not aggravate the mitogenic action of insulin.

No conflict of interest

P-1539

Prevalence of metabolic syndrome in a relatively young adult population in rural Matlab, Bangladesh

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Background: Metabolic syndrome is a strong predictor of diabetes and cardiovascular disease (CVD) and is associated with increased risk of CVD mortality. Population based data on the prevalence of metabolic syndrome is rarely available for rural Bangladesh.

Objective: We examined the prevalence of metabolic syndrome in relatively younger adults (27-50 y) in rural Matlab, Bangladesh.

Subjects and methods: We measured waist circumference (WC), blood pressure (BP), plasma glucose (fasting and 2 h after 75 g glucose challenge), fasting triglyceride (TG) and high density lipoprotein cholesterol (HDL-C) on randomly selected adult males (n=229) and females (n=288). Each metabolic syndrome variable was defined using sex and population specific cut-off values suggested by the International Diabetes Federation (IDF). Metabolic syndrome was defined as the presence of abdominal obesity (high WC) and any two of

the other four variables (high TG, low HDL, high BP, abnormal glucose).
Results: Study participants were 37 years old with average body mass index (BMI) of 20.4 kg/m^2. Females had higher BMI than males (20.8±3.4 vs 19.8±2.9; p=0.000). The overall prevalence high WC, high TG, low HDL, high BP, and abnormal glucose were present among 13.7%, 16.8%, 79.3%, 13.7%, and 19.5% of the individuals, respectively. Females had significantly higher prevalence of high WC (19.8% vs 6.1%; p=0.000), low HDL (84.7 vs 72.5%; p=0.005). Males, on the other hand, had higher prevalence of TG (21.8% vs 12.8%, p=0.007). No difference in the prevalence of high BP was observed between gender however, abnormal glucose tended to be higher in the females than males (17.5 vs 21.2; p=172). Although metabolic syndrome was prevalent among 7.4% of the participants, prevalence was higher among females than males (p=9.7% vs 4.4%; p=0.014).
Conclusions: Metabolic syndrome variables are widely prevalent among relatively younger adults in rural Matlab, Bangladesh. Higher vulnerability of females to MS than males requires further investigation. Identification of the determinants of MS is important for designing primary prevention strategy for diabetes and CVD in Bangladesh.

No conflict of interest

P-1540

Prevalence of dyslipidemia in the study of metabolic syndrome in Maracaibo, Zulia State, Venezuela

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Objetives: Dyslipidemia constitutes a risk factor for cardiovascular disease caused by atherosclerosis; for this reason, the purpose of this research was to determine the prevalence of dyslipidemia in the study of Metabolic Syndrome in Maracaibo.
Methods: Data was obtained from 1400 individuals older than 18 years and both genders (male: 634; female: 766) selected through a random number generation utility. A complete clinical history was made and glycemia, lipid profile and insulin were determined. Results were analized in the statistical program SPSS version 15.0, and were expressed as absolute frequencies and percentages taking the cutoff points suggested by the Adult Treatment Panel (ATP III) - National Institutes of Health (NIH) of EUA.
Results and discussion: 68,1% of the studied individuals had dyslipidemia, most prevalent being isolated low HDLc: 29,1% (n=408), followed by Hypertriglyceridemia with low HDLc: 13,1 % (n=183); and mixed dyslipidemia with low HDLc: 6,9% (n=97). The fourth most prevalent dyslipidemia was the Hypercholesterolemia with low HDLc: 6,2% (n=87), in fifth place the isolated Hypercholesterolemia: 5,5% (n=77), followed by the Hypertriglyceridemia: 4,5% (n=63) and finally, mixed dyslipidemia: 2,8% (n=39). The most frequent abnormality in dyslipidemic individuals was low HDLc with 55,3% (Isolated: 29,1%; Combined with other dyslipidemia: 26,2%).
Conclusion: It is well seen a high prevalence of lipid disorders in our population, which justifiy more studies to determine whether due to enviromental causes, genetic or both, specially those related to low levels of HDLc.

No conflict of interest

P-1541

Characteristics of insulin resistance and the insulin secretory capacity of young male subjects with prediabetes

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Background: Prediabetes is known as an intermediate pathological state that can progress to overt diabetes mellitus. However, the pathophysiological features of prediabetes have not been fully elucidated.
Subjects and methods: This study was conducted on 392 male medical school students between 22 and 35 years of age. All study subjects had their basal anthropometry determined and a 75 g oral glucose tolerance test (OGTT). According to the OGTT results, the subjects were divided into the following four groups: normal glucose tolerance (NGT), isolated IFG, isolated IGT, and combined glucose intolerance (CGI) group. We also measured various insulin resistance indices (HOMA-IR, QUICKI, WBISI, OGIS120), insulin secretion indices (insulinogenic index [IGI], C-peptide response [CPR], HOMAb), and the disposition index (IGIxWBISI), and then compared each of the four groups.
Results: The OGTT results showed that 290 subjects had NGT, 53 subjects had isolated IFG, 28 subjects had isolated IGT, and 21 subjects had CGI. When the isolated IFG, isolated IGT and CGI groups were compared, with respect to the insulin secretory indices, IGI, CPR, and HOMAb were found to be significantly different. However, with respect to the insulin resistance indices, only OGIS120 was significantly different. Moreover, the disposition index, which is the insulin secretory index adjusted for the difference in insulin resistance, was significantly different. These results remained unchanged after adjustment for other confounders by ANCOVA.
Conclusion: There are some distinct pathophysiological and metabolic differences between young Korean male subjects with prediabetes. These findings suggest that prediabetes represents a complex pathophysiological state.

No conflict of interest

P-1542

Erythrocyte glucose uptake and insulin resistance in diabetes and metabolic syndrome

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Background and aim: In recent study was shown increasing erythrocytes glucose uptake in patients with Diabetes Mellitus (DM), obesity (O), impaired glucose tolerance (IGT), which can be viewed as metabolic syndrome (MS). The aim of this investigation was study the relationship EGU with glycemic control degree and insulin resistance index in patients with DM2, O, IGT.
Material and methods: In 127 patients with type 2 DM, 27 with O, 21 with IGT and 18 healthy subjects (HS), fasting (FG) and postprandial (PG) blood glucose, HbA1c level, CRP, plasma insulin (PI), plasma nitrites and nitrates level (NN), erythrocytes sialidase acitity (ESA) were measured, EGU level detected by differences of glucose concentration in erythrocytes after their incubation, and HOMA index was calculated as (FG x PI):22.5.
Results: Results show significantly increased FG (27%) and PG (36%), HbA1c (33%) in patients with DM than HS. In IGT the level of PG (19%) and HbA1c (23%) was significantly increased and this indexes not changed in patients with obesity. The level of CRP, ESA, HOMA was significantly increased and NN significantly decreased in DM, O, IGT groups and suggested tissue damage and presence of insulin resistance. EGU was increased in patients with DM in 2.6 times, P<0.02, in 2.2 times, P<0.05 in IGT group, in patients with obesity in 1.9 times, P<0.05 in compare with HS. Moreover EGU had linkage with FG, ESA, CRP, had dependency of presence and severity of diabetes complications and EGU had positive correlation with HOMA in DM (r=0.62), obesity (r=0.31), IGT (r=0.46) and suggested alteration of EGU as tissue response to insulin resistance.
Conclusion: EGU increased in patients with DM, obesity, IGT and had linkage with glycemia indexes, CRP, ESA, NN, had positive correlation with HOMA and may be viewed as tissue response to insulin resistance.

No conflict of interest

P-1543

HOMA-estimated insulin resistance in Nigerians with type 2 diabetes mellitus

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Objective: To determine insulin resistance using the homeostasis model of insulin resistance (HOMA-IR) in Nigerians with type 2 diabetes mellitus.
Materials and methods: Insulin resistance was assessed using the clinical indices of waist circumference and systolic blood pressure; fasting serum insulin and the calculation of the Homeostasis Model Assessment of Insulin Resistance (HOMA-IR). Glycaemic control was also estimated using fasting plasma glucose and glycated haemoglobin (HbA_{1c})
Results: The mean waist circumference in the male subjects with diabetes of 96.4±2.2cm was higher than the mean waist circumference of 84.3 ± 3.2cm in male controls. The mean waist circumference in the female subjects with diabetes of 97.3±4.0cm was higher than the mean waist circumference of 92.2±3.0cm in female controls.

Control subjects had a mean systolic blood pressure of 120±3.2 mmHg compared with 128.5±2.5 mmHg in subjects with diabetes (p<0.05). Mean fasting serum insulin in control and study subjects was similar (5.0±0.3)µL/ml vs 4.5±0.3µL/ml).
The Homeostasis Model Assessment of Insulin Resistance (HOMA-IR) in the control subjects of 1.2±0.1 was similar to the subjects with diabetes (1.2±0.1). Regression analysis showed that waist circumference was the major contributor to HOMA-IR.
Using the waist circumference, systolic blood pressure, fasting plasma insulin and HOMA-IR, an insulin resistance score was developed. With this summation criterion, 21 (53%) of the subjects with diabetes and 5 (25%) of the controls had insulin resistance.
Conclusions: HOMA-estimated insulin resistance in Nigerians with type 2 diabetes mellitus is similar to control subjects and is related to the waist circumference.
More studies will need to be carried out to better asses the use of the HOMA index of insulin resistance as a measure of insulin sensitivity in Nigerians.

No conflict of interest

P-1544

The relationship between high molecular weight adiponectin and insulin resistance in women with polycystic ovary syndrome

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Objective: Women with PCOS is frequently associated with insulin resistance and a consequent increased risk of metabolic diseases. Adiponectin is an abundant serum adipokine secreted exclusively from differentiated adipocytes, among which high-molecular weight adiponectin plays an important role in regulating insulin sensitivity.The aim of the present study was to investigate the role of HMW-Adiponectin in insulin resistance in women with PCOS.
Methods: Sixty-three patients with PCOS and twenty with normal weight and forty-three with obesity, matched for age and body mass index (BMI), were enrolled in the study. Serum total-adiponectin, HMW-adiponectin, MMW-adiponectin, LMW-adiponectin, were detected in all patients by ELISA and CRP were detected by immunoturbidimetric assay, Clinical, metabolic and sex hormonal parameters), and the waist circumference, body fat rate, body mass index were measured.
Results:
1. Serum levels of total-adiponectin, HMW-adiponectin were significantly lower in patients with PCOS than in normal controls (P<0.01), but serum levels of total-adiponectin were not significantly lower in patients with PCOS with obesity than in simple obesity. Serum levels of CRP, luteinizing hormone,serum androgen, fasting insulin, HOMA-IR were significantly higher in women with PCOS than in normal controls (P<0.01).
2 The percentage of each oligomeric form of adiponectin is difference between normal controls and women with PCOS. Only the HMW-adiponectin level was significantly higher in normal women as compared with PCOS (p<0.05). (3)HMW-adiponectin level was positively correlated with HOMA-IR, FAT%, CRP and body mass index; and negatively correlated with HDL-C (P<0.05).

Conclusion: HMW-adiponectin is good marker (better than total-adiponectin) whose levels correspondingly reflect the degree of insulin resistance in patients with polycystic ovary syndrome.

No conflict of interest

P-1545

Physical activity patterns and relationship with metabolic syndrome in the Maracaibo municipality, Venezuela

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Background and objectives: It is unknown in our population the physical activity levels and its relationship with the development of metabolic syndrome (SM), so the aim of this study is to determine the relationship between the physical activity levels among the population of Maracaibo Municipality and its relationship with the Metabolic Syndrome (MS).
Materials and methods: A descriptive, transversal study was held in 1356 individuals: 741 women (54.6%) and 615 men (45.4%), selected randomly, to whom full clinical history was filled and the International Physical Activity Questionnaire applied. Statistical analysis was performed in the program SPSS 15.0 version. Pearson's Chi-square test and the ANOVA factor were used as appropriate. The diagnosis of Metabolic Syndrome was made according to the International Diabetes Federation diagnostic criteria. Results are expressed as absolute frequencies, percentages and mean ± Standard Deviation as appropriate.
Results: The categorization of physical activity levels was: Low in the 24.3% of the individuals (n = 329) Moderate in the 34.7% (n = 470), and High in the 41.1% (n = 557). There was no significant difference between the METs / min / week of a low level of physical activity with a moderate level (p>0,05), but the difference was significant between the METs / min / week of low and high physical activity (498 ± 1394 vs. 9386 ± 5357, p<0,05). There is an association between high levels of physical activity and the absence of MS (X2 = 20,863, p <0,001), hyperglycemia (X2 = 10,254, p = 0,006), high levels of triacylglycerides (X2 = 12,721, p = 0,002), but not with HDL c-low (X2 = 1901, p = 0,87) or hypertension (X2 = 0058, p = 0,033). There were significant differences (p <0.01) between waist circumference: 97 ±16 vs 92 ±14 cm, fasting glucose levels: 105 ±35 vs 98 ±27mg/dL, triacylglycerides levels: 142 ±98 vs 122 ± 95mg/dL, but not between systolic blood pressure, diastolic blood pressure and HDL-c, in Low and High physical activity levels respectively.
Conclusions: A high level of physical activity is a protective factor for the development of the metabolic syndrome, while moderate and low levels are not.

No conflict of interest

P-1546

Epidemiologic behavior of metabolic syndrome according to IDF, ATP III and EGIR definitions

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Aims: Metabolic Syndrome groups risk factors for cardiovascular disease. There are several classifications for its diagnosis, for this reason, the purpose of this research was to study the epidemiologic behavior of Metabolic Syndrome according IDF, ATP III and EGIR definitions in Maracaibo City, Zulia State, Venezuela.
Methods: It was conducted a transversal and descriptive study in 1400 adult individuals (Female: n=766; Male: n=634) selected through a random number generation utility. A complete clinic history was made and glycemia, lipid profile and insulin were determined. Results were expressed as absolute frequencies and percentages.
Results and discussion: Prevalence of Metabolic Syndrome according IDF was 52,7% (n=738; Female=389, Male=349), ATP III of NIH USA was 34,9% (n=488; Female=256, Male=232), and the EGIR was 17,7% (n=225, Female=106, Male=119); for any of the classifications the prevalence of MS was 54,6% (n=764), and by all of them was 11,5% (n=161).
Conclusion: The great divergence between the several definitions for diagnosis of MS has important influence in its prevalence. It is necesary to make risk studies to compare the different definitions to determine the capacity of prediction, sensitivity and specificity of each one of them in our population.

No conflict of interest

P-1547

Point and interval contrast insulin sensitivity indexes calculated from OGTT

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Aims: To present deterministic and statistical properties of several formulae for calculation of insulin sensitivity index (ISI), using data from frequently sampled oral glucose tolerance test (OGTT), as dimensionless, mutually comparable contrasts within a continuous scale.
Methods: Eleven formulae for ISI calculations were analyzed. The contrasts: 1) point contrasts, calculated as ratios of average ISI values, and 2) interval

contrasts, calculated as ratios of statistics T from the two-group unpaired Student's t-Test at the 0.05 significance level, were used in evaluation of data sets of 10 healthy volunteers and 20 patients, who underwent OGTT during their first visit to an endocrinology department.

Results: The subjects of both groups exhibit statistically different BMI values. The calculated ISI values, obtained using eleven formulae and measured data of both groups, were statistically different at the 0.05 significance level, according to the unpaired t-test. When presented in graphical form, the contrasts of the calculated ISI indicate significantly different properties of individual ISI values, under elimination of effects of their numerical values and dimensions. The formulae used for ISI calculation differed not only in the number of points used for the measurement of glucose and insulin concentration but also in their deterministic and statistical properties.

Discussion/conclusions: According to some authors, the use of ISI in evaluations of data from OGTT, opens the following questions: 1) which formula should be used; 2) what are dimensions of input and output quantities; 3) what are normal ISI values; 4) how to compare results obtained using different ISI formulae; 5) how to compare ISI values with parameters of OGTT model which takes into account gastric emptying rate (1). In answering these questions, based on the results obtained it could be recommended: 1) to use the formulae with the high point contrast in comparisons of data of an individual subject with the standard; 2) to select formulae with high interval contrast in comparisons of data of several subject groups.

Reference:
1. Dedík, L., Durišová, M., Penesová, A., Miklovicová, D., Tvrdonová, M.: Estimation of influence of gastric emptying on shape of glucose concentration-time profile measured in oral glucose tolerance test, Diab Res Clin Prac 2007 77: 377-384.

No conflict of interest

P-1548

Prevalence of metabolic syndrome (MS) among young women with polycystic ovarian syndrome (PCOS) in a rural area in Egypt: comparison of 3 different definition criteria

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Background: The prevalence of metabolic syndrome is increasing worldwide with an emerging epidemic especially in developing nations. The prevalence of metabolic syndrome in relation to PCOS has not been widely evaluated in young women in our locality.

Objective: To estimate the prevalence of metabolic syndrome among young rural Egyptian women with PCOS.

Patients & methods: 312 women fulfilling the Rotterdam consensus criteria (2003) of PCOS, were selected from the Gynecology and Endocrinology Outpatient Clinics, Mansoura University Hospitals. They were all screened for the presence of metabolic syndrome both clinically and biochemically (Blood pressure, anthropometric measurements, fasting plasma glucose, serum triglycerides, high density lipoprotein, insulin resistance, and free testosterone). Metabolic syndrome was defined in each case according to the World Health Organization criteria (WHO, 1999), the National Cholesterol Education Program - the Modified Adult Treatment Panel III (NCEP-ATP III panel, 2001) and International Diabetes Federation criteria (IDF, 2005)

Results: 125 women out of the 312 examined met the IDF (2005) criteria (40%), 122 cases met the NCEP-ATP III definition criteria (39.1%), while only 33 women (10.6%) fulfilled the WHO criteria for metabolic syndrome. The prevalence of metabolic syndrome significantly increased with age, body mass index, insulin resistance, and free testosterone. When the IDF (2005) criteria were adopted, the least representative component of metabolic syndrome was elevated fasting plasma glucose (17.2%) while the highest prevalent component of the syndrome was central obesity (77.9%).

Conclusion: Metabolic syndrome in women with PCOS is a common abnormality. The IDF (2005) definition of metabolic syndrome is comparable to that of the NCEP-ATP III (2001). Both can be utilized satisfactorily in the diagnosis of metabolic syndrome especially in young women.

No conflict of interest

P-1549

Changes in adiponectin, leptin and inflammatory markers in persons with metabolic syndrome

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Background and aims: The role of insulin resistance and hyperinsulinemia as etiopathogenic factors of MS is complex and is thought to be closely related to the presence of abdominal obesity and to a secretory dysfunction of adipocytes. The aims of our study were to assess plasma levels of adiponectin, leptin, proinflammatory cytokines (IL 6, TNF a), hs-CRP, fibrinogen, insulin resistance and to evaluate the prevalence of atherosclerotic cardiovascular disease in persons with and without MS.

Material and methods: The study enrolled 242 subjects with MS (IDF criteria) and 212 without MS, aged over 20 years, whose main characteristics are presented in table 1.

Table 1. Characteristics of persons with and without MS

Parameter	Without MS	With MS	p
Male/Female	98/114	109/133	NS
Age (years)*	46.32 ± 13.82	51.46 ± 12.74	<0.001
Adiponectin (µg/mL)*	13.42 ± 2.31	6.81 ± 1.54	<0.001
Leptin (ng/mL)*	6.21 ± 2.32	14.33 ± 3.82	<0.001
TNF a (pg/mL)*	5.12 ± 1.14	9.54 ± 2.41	<0.001
IL 6 (pg/mL)*	2.91 ± 0.73	5.23 ± 0.92	<0.001
hs-CRP (mg/L)*	2.14 ± 0.64	5.82 ± 1.56	<0.001
Fibrinogen (mg/dL)*	194.22 ± 28.42	386.41 ± 44.12	<0.001
HOMA-IR*	2.19 ± 0.51	5.03 ± 1.35	<0.001

*Data are means ± SD. P was calculated with unpaired Student's t test.

Results: The serum level of adiponectin, adipocytokine with anti-inflammatory and insulin sensitizing effects, was lower ($p<0.001$) in individuals with MS than in those without MS, and was negatively correlated with the waist circumference (WCF) ($r= - 0.66$, in men, and $r= - 0.64$, in women), BMI ($r= - 0.54$) and HOMA-IR ($r= - 0.58$, in men, and $r= - 0.61$, in women).

For subjects with MS, the serum levels of leptin and inflammatory markers were significantly ($p<0.001$) higher compared to those without MS and correlated positively with the BMI, WCF and HOMA-IR. We found a negative correlation between adiponectinemia and serum levels of leptin, TNF a, IL 6, hs-CRP and fibrinogen.

For subjects with MS, the cumulated prevalence of ischemic heart disease and cerebrovascular disease was 3.3 times that encountered in persons without MS.

Conclusion: Our results sustain the hypothesis that the secretory dysfunction of proinflammatory and anti-inflammatory adipocytokines represent the main link between abdominal obesity, insulin resistance and atherosclerosis.

No conflict of interest

P-1550

Assessment of insulin resistance in South East Asian women with polycystic ovary syndrome (PCOS)

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Objective: To assess insulin resistance (IR) in South East Asian women with PCOS.

Methods: This cross sectional study was carried out at Baqai Institute of Diabetology and Endocrinology (BIDE) from January 2006 to December 2008. Patients fulfilling the revised 2003 Rotterdan diagnostic criteria for PCOS were included. Data of 91 patients was available for statistical analysis. Descriptive statistics were calculated using frequency and mean with standard deviation. IR was calculated using fasting blood sugar (FBS) and fasting insulin levels. Different surrogate markers of IR like Homeostatic model assessment of IR (HOMA-IR) and quantitative sensitivity check index (QUICKI) were calculated.

Results: The mean BMI of patients with PCOS was 31.85 ± 7.93. 37% of patients were infertile. Co-morbid like type 2 diabetes was seen in 12.7% patients while 15.11% patients were hypertensive. Using HOMA-IR (=2.6) 70% patients were insulin resistant while with QUICKI (=0.35) IR was seen in

88% patients. Only 43.9% of patients were having typical cystic appearance of ovaries on ultrasound.
Conclusion: Frequency of insulin resistance in patients with PCOS is quite high in South East Asian women. Further large scale studies are needed to validate the findings of this study, so that the long term sequel of IR can be prevented.

No conflict of interest

P-1551

Prevalence of metabolic syndrome in the adult population of the municipality of Maracaibo, Venezuela

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Introduction and objectives: The Metabolic Syndrome (MS) is caused by the interaction of genetic and environmental factors. The aim of this study was to determine its prevalence in individuals of the Municipality of Maracaibo, Estado Zulia.
Materials and methods: A descriptive, transversal study was held in 1400 subjects older than 18 years (female, n = 389, male n = 349), which was performed complete clinical history and determined fasting blood glucose, insulin and lipid profile. We used the criteria of the International Diabetes Federation to diagnose MS, expressing results as absolute frequencies and percentages.
Results: The prevalence of Metabolic Syndrome was 52.7% (n = 738), predominantly female (52.7%, n = 389) over male (47.3%, n = 349) and more frequently in age groups of 40-49 (26%, n = 192) and 50-59 years (23.3%, n = 172). The parish with higher prevalence of Metabolic Syndrome was Francisco Eugenio Bustamante with 19.6% (n = 145). Socioeconomic status IV showed the highest prevalence with 37.7% (n = 278). The most frequent diagnostic combination was the presence of central obesity + low HDL + fasting glycaemia ≥ 100 mg / dL (or diagnosis of DM-2) with 28.9% (n = 213) followed by central obesity + elevated triacylglycerides + fasting glycaemia ≥ 100 mg / dL (or previous diagnosis of DM-2) with 14% (n = 103).
Conclusion: The prevalence of Metabolic Syndrome in our population is higher than the ones detected in others urban areas of Latin America, which requires further studies to establish the validity of the cutoff points used for diagnosis of this syndrome in our population and its relationship with cardiovascular morbidity and mortality.

No conflict of interest

P-1552

Insulin resistance and its relationship with age in an Asian diabetic cohort

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Background: The relationship between insulin resistance and aging is still debated. The fast transition of India and other Asian countries to western lifestyle has made the country a hub for the disease and diabetes is fast emerging as one of the most common chronic ailments to affect young adults. Obesity and inactivity have increased cases of type2 diabetes among people of younger age which was earlier prevalent only in those above 45 years of age. In this study we aimed at comparing insulin resistance and other metabolic parameters among freshly detected diabetics among those having young (<45 yrs) and old (>45yrs) onset diabetes.
Aim: To compare the insulin resistance and other metabolic parameters between type 2 diabetics having young or old onset of diabetes.
Methods: 97 freshly detected type 2 male diabetics were enrolled into the study and stratified into those having young (</=45yrs) or late onset (>45yrs) of diabetes. Several anthropometric and metabolic parameters like BMI (Body mass index), WHR (waist hip ratio), Body Fat Percentage, HsCRP, Glycemic control, Insulin resistance (HOMA-IR index), lipids, uric acid and serum transaminases were compared. The results were tabulated and statistically analyzed.

Results:
- Total number of cases: 97
- No of young onset diabetics = 44/97 (45.36%)
- No of old onset diabetics = 53/97 (54.64%).

	Young onset diabetes	Old onset diabetes	P value
N	39	58	
BMI	26.1±2.5	25.4±2.5	0.240665
Body fat	22.9±7.9	23.7±7.9	0.588181
HsCRP	0.31±7.06	1.31±7.06	0.318607
HbA1c	9.05±2.87	8.61±2.87	0.398738
HOMA-IR Index	3.94±4.17	3.23±4.17	0.377052
C-peptide	1.62±0.95	1.85±0.95	0.244053
Total cholesterol	192.55±52.56	197.1±45.56	0.586133
Triglyceride	171.49±79.57	165.75±79.57	0.714238
LDL	134.84±43.78	127.88±43.78	0.375716
HDL	36.93±8.46	37.55±8.46	0.683386
Uric acid	4.86±1.3	5.14±1.3	0.26978352
SGOT	30.11±17.75	26.45±17.75	0.4479044
SGPT	34.49±22.32	30.91±22.32	0.3914123

The subjects in both the groups had similar degree of Obesity (BMI and Body Fat) and Glycemic control. P values between the two groups for insulin resistance were insignificant.
Conclusion: We did not find any correlation between age and Insulin resistance among the two groups who were matched for obesity and Glycemic status, suggesting that age has no direct role to play in increasing IR in older individuals. Perhaps progressive beta cell failure contributes more towards development of diabetes in older age group. Larger studies will be needed to confirm the same.

No conflict of interest

Obesity: weight regulation, prevention, management, pathophysiology

P-1553

Dual energy X-ray absorptiometry assessment of fat mass distribution in type 2 diabetic patients

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Background/aims: The distribution of body fat has been identified as a significant risk factor for the development of cardiovascular disease. Understanding the links between topographic features of adipose tissue and the various parameters of metabolic syndrome in type 2 diabetes mellitus (DM) is important for the prevention of macrovascular complications. The aim of the study was to assess the features of fat mass distribution in premenopausal women with type 2 DM in comparison with men and postmenopausal women. Materials and methods: 103 patients with type 2 DM (81 women, mean age 58,55 ± 7,52 yrs; 22 men, mean age 58,34 ± 7,44 yrs) and 40 (28 women, 12 men) controls matched for age, sex and body mass index were examined. The research involved anthropometry of patients (height, weight, BMI, waist circumference), general clinic examination, glycated hemoglobin test, dual energy X-ray absorptiometry (Body composition program). Fat mass distribution research was based on Total Body, Android, A/G Ratio, Trunk/Total, (Arms+Legs)/Total parameters.
Results: Fat mass distribution parameters in type 2 DM women and men were: Total Body: 38,27±7,05% vs 31,99±4,13% (p<0,01); Android: 46,80 ±6,28% vs 40,75±4,04% (p<0,01); A/G Ratio: 1,10±0,17 vs 1,41±0,24 (p<0,01); Trunk/Total: 0,58±0,07 vs 0,64±0,05 (p<0,01); (Arms+Legs)/Total:0,72±0,22 vs 0,67±0,18 (p<0,01). The android component of adipose tissue was examined in type 2 DM women depending on menopause in comparison with nondiabetic control group matched for age, body mass index and duration of menopause. It was found that android component in premenopause as well as in postmenopause is statistically higher (p<0,05) among women with type 2 DM as compared with controls (45,46 ± 6,64 vs 35,83 ± 6,57 in premenopause and 45,21 ± 6,78 vs 43,78 ± 6,98 in postmenopause). The data concerns type 2 DM there are no differences in consistence of android component in premenopause and postmenopause, unlike control group.

Conclusions: The results of study confirm the prevalence of central (android) distribution of body fat among men with type 2 DM; android component of fat mass dominates gynoid component among patients with type 2 DM. The women with type 2 DM are more likely to have significant visceral fat masses at earlier age than women without diabetes.

No conflict of interest

P-1554

Recovery of insulin sensitivity after treatment with 11ß-hydroxysteroid dehydrogenase (11ß – HSD) blocker carbenoxolone involves increased GLUT4 expression in oxidative muscle fibers

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Glucocorticoids are known to impair insulin-induced glucose uptake in peripheral tissues. GLUT4 (glucose transporter 4) protein, which is a key determinant of the glucose uptake in insulin sensitive tissues, may be regulated by the glucocorticoids, contributing to the insulin resistance observed in hypercortisolism. 11ß -hydroxysteroid dehydrogenase (11ß –HSD), the enzyme which interconverts cortisol to its inactive metabolite cortisone, has recently been recognized as a key regulator of the access of cortisol to target tissues. Carbenoxolone, which blocks the 11ß –HSD enzyme, has been shown to increase hepatic insulin sensitivity, but effects on glucose uptake in peripheral tissues are unknown.
Aim: The aim of the present study was to determine if the treatment with carbenoxolone would be able to restore the insulin sensitivity in insulin resistant obese rats and if this effect could be related to GLUT4 expression in muscle.
Methods: Monosodium glutamate-induced obese (O) rats were given carbenoxolone (Cbx, 50mg/kg/day, p.o.), for four weeks (OCbx) and compared to age-matched control rats (C). All groups were submitted to insulin tolerance tests (ITT) and GLUT4 protein analysis in soleus (oxidative fibers) and EDL (glycolytic fibers) skeletal muscles.
Results: Glycemias were similar among all groups (C: 119.4 ± 3.5mg/dl; O: 113.7± 4.4mg/dl; OCbx: 113.1± 2.8mg/dl, $p>0.05$) in spite of the hyperinsulinemia of O rats (61.36 ± 4.63µU/ml) as compared to C rats (40.13 ± 5.46µU/ml). Chronic treatment with Cbx normalized insulinemia (OCbx: 46.50 ± 4.33µU/ml) and insulin sensitivity, since the glucose decay in the insulin tolerance test (kITT) was lower in obese rats, but was restored by the Cbx treatment (O: 3.42%/min, $p<0.01$vs. C: 5.06%/min and OG: 4,68%/min). GLUT4 protein was significantly reduced in O rats in both EDL (O: 92.0 ±19.7AU, $p<0.05$ vs. C: 183.4 ±15.8AU) and soleus muscles (O: 473.9 ± 53.9AU, $p<0.05$ vs. C: 665.2 ± 40.4AU). Cbx treatment had no effect on GLUT4 protein in EDL (OCbx: 111.8 ±14.55AU, $p>0.05$ vs. O) but significantly increased its expression in soleus (OCbx: 642.6 ± 21.8, $p<0.05$ vs. O).
Conclusion: Insulin resistance of the obese rats was importantly related to reduction in GLUT4 protein expression in skeletal muscle. The Cbx drug was able to restore insulin sensitivity in MSG-obese rats and this effect probably involves enhanced glucose uptake by the oxidative fibers, as suggested by the increased GLUT4 expression in soleus muscle.

No conflict of interest

P-1555

Effects of PPAR-d agonist on toll-like receptors (TLRs), NF-kB activity and expression of proinflammatory cytokines in adipocytes

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Chronic inflammatory activity in fat tissue has recently been implicated in mechanisms of insulin resistance and obesity related metabolic dysfunction. Toll-like receptors (TLRs) play a key role in innate immune responses, recent studies implicate that activation of TLRs with either lipopolysaccharide (LPS) or free fatty acid (FFA) stimulates NF-kB signalling and expression of proinflammatory cytokines, which are involved in the development of insulin resistance. It is not well known if PPAR-d and its ligand exert any effect on TLR/NF-kB signaling pathway and expression of proinflammatory cytokines in adipocytes. The aim of this study was to observe effects of PPAR-d agonist on these inflammatory pathways and proinflammatory cytokines production in cultured adipocytes.
Differentiated 3T3-L1 adipocytes were stimulated with FFA and LPS, we quantified the mRNA expression levels of TLR2, TLR4 and proinflammatory cytokine genes, such as interleukin-6 (IL-6), tumor necrosis factor-a (TNF-a), monocyte chemoattractant protein-1 (MCP-1) using quantitative real-time PCR, and NF-kB activation using electrophoretic mobility shift assay (EMSA). To investigate the effect of the PPAR-d agonist (L-165041) on FFA, LPS-induced TLRs/NF-kB signaling pathway and expression of proinflammatory cytokines, we compared the gene expression levels of TLRs and IL-6, MCP-1, TNF-a and NF-kB activity between 3T3-L1 adipocytes treated with PPAR-d agonist and non-treated control adipocytes. mRNA expression levels of TLRs and proinflammatory cytokine genes were significantly increased in 3T3-L1 adipocytes treated with LPS and FFA ($P<0.05$). PPAR-d agonist (L-165041) significantly blocked these LPS, FFA-induced expression of TLRs and IL-6, MCP-1, TNF-a ($P<0.05$). Also, LPS and FFA treatment stimulated NF-kB DNA binding activity and PPAR-d agonist (L-165041) blocked them, too ($P<0.05$).
Activation of TLRs/NF-kB signalling pathway and their target proinflammatory cytokine production were inducible in adipocytes by LPS and FFA. PPAR-d showed an anti-inflammatory effect through repressing LPS, FFA- induced TLRs/NF-kB pathway and proinflammatory cytokine production in adipocytes.

No conflict of interest

P-1556

Adiponectin inhibits spontaneous lipolysis in obese, but not non-obese individuals

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Aims: Adiponectin is an adipose tissue derived cytokine increasing glucose and fatty acid metabolism in muscle and improving whole-body insulin sensitivity. The aim of this study was to investigate the role of adiponectin in the regulation of adipocyte lipolytic activity.
Methods: Adipocytes were isolated from adipose tissue obtained during selective surgical operations from 12 non-obese and 8 obese subjects. Cells were incubated for one hour without treatment and subsequently subjected to incubation with recombinant human adiponectin (20 ug/ml) or 0.5 mM AICAR - chemical activator of AMPK (adenosine monophosphate activated protein kinase). Finally, isoprenaline was added to investigate the influence on catecholamine-induced lipolysis. Glycerol concentrations were determined colorimetrically.
Results: Adiponectin suppressed spontaneous lipolysis by 21.6 % in non obese ($p=0.03$) but only by 6 % in obese subjects ($p=0.56$). Adiponectin inhibited isoprenaline-induced lipolysis by 27% ($p=0.03$) in non-obese, while no effect was observed in obese subjects. AICAR inhibited both spontaneous and isoprenaline-induced lipolysis in obese as well as non-obese subjects.
Discussion: Our results show that adiponectin in physiological concentration inhibits spontaneous as well as catecholamine-induced lipolysis in isolated human adipocytes of non-obese subjects. This regulation is lost in obesity. This mechanism might be mediated by an activation of AMPK. We suggest that inhibition of lipolytic rate in adipose tissue by adiponectin is an important factor limiting release of free fatty acids (FFA) into circulation and helps to explain how hypoadiponectinemia might contribute directly to elevated FFA levels and development of insulin resistance.

Conflict of interest:
Other substantive relationships: The work was supported by The Grant Agency of Czech Republic GACR 303/07/0840 and by the European Community 7th Framework Programme project ADAPT (HEALTH-F2-2008-201100) and 6th Framework Programme HEPADIP (LSHM-CT-2005-018734).

P-1557

Weight misperceptions in rural Australia: recognising weight status in an environment where overweight and obesity are the norm

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Background: Obesity is an important modifiable risk factor for many chronic diseases. Overweight and obesity has been reported to be higher in rural Australia. The incidence of diabetes has also been reported to be higher in rural and remote areas. Failing to recognise overweight and obesity would have important public health implications in relation to chronic disease risk perception and prevention, such as diabetes prevention.
Aim: To investigate the difference between personal and clinical classifications of weight status in a rural Australian population.
Methods: Cross-sectional surveys including clinical health measures were conducted in three rural areas of South Eastern Australia in 2004–06. A stratified random sample (n=1563, response rate 48%) of men and women aged 25-74 years was drawn from the electoral roll. Participants were asked "How do you consider your weight? Too thin, a little thin, normal, a little overweight, or very overweight?" Body mass index (BMI) and waist circumference (WC) were measured by trained study nurses using the World Health Organisation (WHO) MONICA protocol and then categorised using WHO recommended standards. Since participants' weight can fluctuate daily, those who would change BMI category if their weight changed by 2kg were excluded in evaluating accuracy of self-assessed weight.
Results: Overall, 29.2% of participants were categorised as normal weight (18.5–25kg/m^2), 39.5% overweight (25–30kg/m^2), and 30.3% obese (>30kg/m^2). Among obese individuals, 3.2% reported their weight as 'normal', 56.8% reported their weight as 'a little overweight', and 40.0% reported their weight as 'very overweight'. Among overweight individuals, 24.8% reported their weight as 'normal,' and 73.9% reported their weight as 'a little overweight'.
WC cut-offs used were 94/102cm for men, and 80/88cm for women, resulting in 36.3% being normal, 24.1% overweight, and 39.6% obese based on WC. Among participants with WC in the obese range, 7.2% reported their weight as 'normal', 65.9% as 'a little overweight', and 26.8% as 'very overweight'. Among individuals in the overweight range, 33.3% reported their weight as 'normal', and 66.0% as 'a little overweight'.
Discussion/conclusion: In this rural population, 60% of people with a BMI in the clinically obese category did not consider that they were 'very overweight'. Overall levels of overweight and obesity were also high. Misperceptions of overweight and obesity may be linked to living in an environment where the majority of people are overweight or obese. Levels of overweight and obesity have been reported to be higher in rural than urban areas. These findings have important implications regarding recognition of chronic disease risk in rural populations.

Conflict of interest:
Other substantive relationships: This study was supported by the Australian Government Department of Health and Ageing, Royal Australian College of General Practitioners, Sanofi-Aventis, Pfizer, Roche Diagnostics Australia, and Servier Laboratories

P-1558

Glucocorticoids are capable of stimulating both lipolysis and adipogenesis in 3T3-L1 adipocytes

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Glucocorticoids (GCs) impact many metabolic pathways in peripheral tissues that promote insulin resistance and the development of type 2 diabetes. Although their effect on glucose metabolism is well defined in various tissues, their influence on lipid metabolism is less clear. Some studies show that GCs acutely stimulate lipolysis in adipose cells, while, paradoxically, other studies show that longer-term exposure promotes central obesity and features of the metabolic syndrome. We set out to determine the short- and long-term effects of corticosterone (CORT), the main rodent GC, on adipogenesis (formation of new fat cells), lipolysis (promotion of free fatty acid release) and lipogenesis (creation of lipid from glucose) in adipocytes. 3T3-L1 adipocytes were treated with increasing concentrations of CORT (0.01-100 uM) for 48 hrs. Lipolysis, as measured by glycerol release, was maximally increased 77±9% above control levels with 1 uM CORT ($p<0.05$). Protein expression of adipose triglyceride lipase (ATGL), a major lipolytic enzyme, was increased 193±44% ($p<0.01$) with 1uM CORT, while no change in HSL (hormone sensitive lipase) protein expression was observed. However, the basal phosphorylated states of HSL (at Ser563 and Ser660, which increase HSL activity) were increased in a concentration-dependent manner (378±68% and 165±21% with 1 uM CORT, respectively, $p<0.01$). Visualizing adipocytes with microscopy revealed that CORT treatment attenuated the increases in both lipid droplet size and overall cell size as compared to control cells. Additionally, CORT treatment had no effect on the rate of ^{14}C-glucose incorporation into cellular lipid, indicating no changes in lipogenesis. Finally, 3T3-L1 pre-adipocytes were induced to differentiate with varying concentrations of CORT for 6 days. Based on oil red O staining, cell differentiation increased in a concentration-dependent fashion with increasing CORT and was maximal with 1 uM CORT (20±4 vs. 100±2 AU; Con vs. 1 uM CORT, respectively, $p<0.01$). Taken together, these data indicate that GCs promote pre-adipocyte differentiation, and cause lipolysis but not lipogenesis in mature fat cells, thus resulting in smaller, more metabolically active adipocytes. These findings suggest that chronic exposure to GCs in vivo would promote an increase in fat cell number but these adipocytes would be more metabolically active, resulting in an overall increase in circulating free fatty acids.

No conflict of interest

P-1559

Extramyocellular adipose tissue in type 2 diabetes

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Aims: Ectopic fat depositions in skeletal muscle, i.e. intermuscular adipose tissue and intramyocellular lipids, are associated with insulin resistance and diabetes. However, extramyocellular adipose tissue (EMAT), defined as the adipose tissue (AT) between muscle fibers, has not been investigated. We sought to examine EMAT distribution in subjects with Type 2 diabetes (T2D) and evaluate possible differences as a function of gender and race. In addition, we assessed associations of EMAT with measures of adiposity, inflammation, and insulin sensitivity (IS).
Methods: EMAT was assessed by proton magnetic resonance spectroscopy in the tibialis anterior muscle ($EMAT_{TA}$, n=71), soleus ($EMAT_{Sol}$, n=70), and gastrocnemius ($EMAT_{Ga}$, n=50) in subjects with T2D [Ages 56.5±8 (mean±SD) and BMI of 31.7±5 kg/m^2]. Internal water reference was used to normalize all EMAT results. Adiposity measures were performed using DXA for total body fat (FM) and cross-sectional CT scans for visceral AT volume (VAT), deep subcutaneous AT volume (DSAT), and subcutaneous AT volume (SAT). Serum chemistries were analyzed for inflammatory markers. IS was assessed by hyperinsulinemic-euglycemic clamps. Subcutaneous abdominal biopsies were obtained and evaluated for mean fat cell size (MFCS) at the baseline of the clamp.
Results: Female subjects had increased $EMAT_{TA}$ compared to male subjects (0.0149±0.01 vs. 0.009±0.01, arbitrary scanning units (ASU), p=0.02). No other gender or race differences were noted. However, $EMAT_{TA}$ was positively associated with FM (r=0.323, p=0.02). $EMAT_{Sol}$ was directly correlated to hs-CRP (r=0.360, p=0.02), TNF-a (r=0.339, p=0.03), and IS (r= -32, p=0.05). $EMAT_{Ga}$ was associated with FM (r=0.486, p=0.001), VAT (r=0.250, p=0.08), and MFCS (r=0.459, p=0.001). In an age-FM adjusted cohort (n=51), increased $EMAT_{TA}$ in female subjects remained when compared to male subjects (0.0171±0.01 vs. 0.009±0.01, ASU, p=0.003). African-Americans showed a trend toward higher $EMAT_{Sol}$ compared to Caucasian (0.025±0.02 vs. 0.016±0.01, ASU, p=071). No other differences were observed. $EMAT_{TA}$ was positively correlated with FM (r=0.354, p=0.02) and TNFa (r=0.403, p=0.03). $EMAT_{Sol}$ showed direct association to TNFa (r=0.403, p=0.03). $EMAT_{Ga}$ showed positive correlation to FM (r=0.369, p=0.04), DSAT (r=0.396, p=0.02), and MFCS (r=0.428, p=0.01).
Discussion: We present novel observations of EMAT in Type 2 diabetes subjects. We demonstrate gender differences in $EMAT_{TA}$ distribution. A robust pattern emerged showing strong associations between $EMAT_{TA}$ and $EMAT_{Sol}$ to inflammatory markers and insulin sensitivity, while $EMAT_{Ga}$ consistently

displayed direct associations to measures of adiposity. EMAT is a novel ectopic adipose depot that may offer insights into the cross-communication network between AT and skeletal muscle.

No conflict of interest

P-1560

Dietary patterns and risk of type 2 diabetes: the multi-ethnic cohort

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Aims: It is well known that excess energy intake and overweight/obesity are risk factors for the development of type 2 diabetes. Our goal was to find out if the type and composition of the regular diet also influences diabetes risk. Using the Hawaii component of the Multiethnic Cohort (MEC), we estimated diabetes risk associated with different nutritional patterns.

Methods: After excluding subjects with other ethnicity, invalid diet, and missing values, 75,512 Caucasians, Japanese Americans, and Native Hawaiians were included in this analysis. Of these, 8,587 were incident diabetes cases which had been identified through questionnaires and linkages with the two major health plans in Hawaii. All subjects completed a validated food frequency questionnaire. Three previously identified dietary patterns, "Vegetables", "Milk and Fruits", and "Fat and Meat", and food groups were analyzed in relation to diabetes incidence using Cox proportional hazards models. We estimated hazard ratios (HR) and 95% confidence intervals (CI) while adjusting for age, ethnicity, education, body mass index (BMI), physical activity, and total energy intake.

Results: Diabetes cases were more likely to be Japanese American or Native Hawaiian than the non-cases and tended to have lower education and higher BMI. Native Hawaiians were more likely to have high scores for the "Fat and Meat" and "Vegetables" patterns, while Japanese Americans showed a stronger association with the "Vegetables" and Caucasians with the "Fruit and Milk" pattern. "Fat and Meat" was associated with a 50% higher diabetes risk among men when the highest quintile was compared to the lowest (p_{trend} <0.0001). In women, the risk was approximately 20% higher (p_{trend} = 0.01) for women in the highest quintile. The associations for the "Fat and Meat" pattern were consistent across ethnic groups. The "Vegetables" pattern was weakly protective against diabetes among men, but the trend test was only significant for Caucasians and Japanese Americans. In women, the "Vegetables" pattern did not lower diabetes risk in any of the three ethnic groups. On the other hand, the "Milk and Fruits" pattern was associated with a lower diabetes risk among women with fairly consistent risk estimates across ethnic groups, while a protective effect in men was restricted to Caucasians. When we examined individual food groups, the results were in agreement with the dietary patterns. In particular, a strong association with red meat was seen among all ethnic groups.

Conclusions: These findings within a multiethnic population indicate that food intake as described by dietary patterns is strongly associated with diabetes risk. Therefore, recommending diets low in meat and rich in vegetables and fruits may be protective against type 2 diabetes independent of weight control.

No conflict of interest

P-1561

Remission of type 2 diabetes related to morbid obesity after bariatric surgery

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Introduction: It was reported a consistent improvement of hyperglycaemia in obese patients who underwent bariatric surgery. This is considered one of the most important contributions of Bariatric Surgery taking into account the consequences of Type 2 Diabetes.

Objectives: To assess the evolution and achievement of amelioration and remission of Type 2 Diabetes (DM 2) in a group of morbid obese patients (MO) who underwent bariatric surgery.

Methods: 19 morbid obese patients who underwent bariatric surgery in Hospital Privado de Cordoba, between 2001 and 2008, with DM 2, were included. These patients had a usual treatment and frequent control after surgery.

The evolution time and medical treatment of DM 2 were considered. Blood samples for fasting blood glucose and glycated haemoglobin (HbA1c), before the surgery, at a month and at six months, were taken. Weight, height, BMI and waist circumference were measured as well.

We characterize amelioration as reducing the number and/or dose of drugs to maintain good control of DM 2. To define remission, Dixon JB et al. criteria were adopted (fasting glucose level <126 mg/dl and HbA1c value <6.2% while taking no glycaemic therapy) (JAMA 2008; 299 (3): 316- 323).

In many patients who achieved remission criteria and regular follow up, OGTT was conducted between June 2008 and March 2009, irrespective the length of post- operative.

Results: 16 patients (84 %) met the criteria for remission of DM 2.2 (11 %) achieved amelioration and 1 (5 %) remained unchanged. The evolution time of DM 2 varied between a few months and 31 years. The average reduction rate of overweight in the remission group was 55 % and the average BMI decrease of 13.3 kg/m^2. The average reduction in waist circumference was 29.5 cm.

OGTT was conducted in 13 people of the remission group; 12 of them showed normal results and 1, glucose intolerance.

Conclusion: Weight loss obtained 6 months after bariatric surgery was accompanied, in the group of studied patients, by improvements in DM 2 in almost all the cases (95 %), reaching the point of remission in most of them (84 %).

No conflict of interest

P-1562

Effects of native banana resistant starch on body weight and insulin resistance in non-diabetic obese women

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Evidence from several studies indicates that overweight and obesity are associated with an increased risk of diabetes. The key determinant of the association between these diseases is the insulin resistance (IR). This state is characterized as the tissues' inability to take up glucose in response to insulin. Body weight accumulation has been associated with IR in both human and animals. Some studies have shown benefit from life style changes (diet and nutrition) on reducing diabetes risk. Resistant starch supplementation from different sources has demonstrated beneficial effects on reducing body weight and improving glycemic control. The aim of this study was to investigate the effects of Native Banana Resistant Starch (NBRS) on body weight and insulin resistance in a group of obese non diabetic women. Obese non-diabetic women (BMI >30), 20-45 years aged were invited to participate if they had a Homeostatic Model Index (HOMA) values > 2.5. Selected subjects were randomly assigned to two groups of 20 subjects. One group received NBRS 30 g/d during 8 weeks and the other metformin (MF) 850 mg/d during the same period. A clinical interview and nutritional survey was performed at the beginning and every month until the end of the experiment. Anthropometric measures, arterial blood pressure and fat percentage were measured. Blood samples were obtained for routine clinical chemistry assays and insulin was determined by an enzymatic immunoassay and HOMA indexes were calculated. A significant reduction were observed in glycemia after both NBRS and MF treatment ($p < 0.05$). NBRS reduced fasting insulin (ANOVA, $p < 0.01$) through time (27.7% and 38.78 % at 4 and 8 weeks respectively). MF diminished fasting insulin through time (24.7% and 34.96% at 4 and 8 weeks respectively). There were not significant differences between NBRS and

MF effects on serum insulin. Both interventions reduced HOMA indexes along the time (ANOVA, p<0.01) and there were no significant differences between them. MF reduced cholesterol since the first month of treatment (p <0.05). No changes were observed in body weight, blood lipids, hepatic enzymes, serum magnesium and other variables after both treatments. In conclusion NBRS supplementation reduced fasting glucose and insulin levels reducing insulin resistance in a similar degree to metformin treatment.

No conflict of interest

P-1563

Predicting changes in life-style and clinical outcomes in preventing diabetes

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Background: Strong evidence from several studies has indicated that lifestyle changes can prevent and delay the onset of type 2 diabetes. The Diabetes Prevention Programme was carried out in Greater Green Triangle region in Australia. The programme was shown to be feasible and effective in a "real life" health care setting. The programme design was based on the Health Action Process Approach (HAPA) model.

Aim of the study: The aim of this study was to analyze how different determinants of lifestyle changes targeted in the program predict the actual changes in dietary behaviour and clinical outcome measurements.

Methods: A longitudinal pre test and post test study design was used. Out of 311 who started the intervention, 237 attended both the baseline and 12 month clinical tests and at least one group session and were thus regarded as completers. Intervention consisted of six structured 90 minute group sessions over eight months. To examine the associations between the variables, structural equation modelling (SEM) was used. We modelled the changes in determinants for lifestyle variables to the changes in dietary behaviours and clinical outcome measurements.

Results: Changes in action self-efficacy and action planning variables at three months predicted changes in fat and fiber intake through changes in coping self-efficacy and coping planning variables. Changes in fat and fiber intake predicted change in waist circumference which predicted improvement in all clinical outcome measurements.

Conclusion: The result demonstrated that changes in the lifestyle determinants predicted behavioural changes which led to reduction in waist circumference and improvement in clinical outcome measures. These results support the importance of theory based interventions.

No conflict of interest

P-1564

Glucocorticoids increase adiposity and alter adipose tissue phenotype in rats, despite elevated lipolytic rates

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The impact of glucocorticoids on adipose tissue metabolism is controversial. While some studies show a lipolytic role for the hormone, disease states such as Cushing's syndrome (a disease characterized by elevations in glucocorticoids) are commonly associated with increased adiposity, particularly in central regions. Our in vitro data suggests that the rodent glucocorticoid, corticosterone (CORT), stimulates lipolysis, but not lipogenesis, in 3T3-L1 adipocytes. Furthermore, CORT is vital to pre-adipocyte differentiation (adipogenesis), suggesting that CORT exposure may lead to increase in the absolute number of cells in adipose tissue. The purpose of this study was to induce basal hypercorticosteronemia in rodents and measure adipose tissue growth and metabolism in vivo. For this, male Sprague-Dawley rats were divided into three groups: sham, CORT, or pair-fed (n=5/group). CORT animals had two 150 mg CORT pellets subcutaneously implanted, whereas sham and pair-fed animals received two 150 mg wax pellets. Body weight and food intake were measured for 10 days, with pair-fed animals being given the average food consumed by CORT animals the night prior. Animals were fasted overnight on day 9, sacrificed on day 10, and their adipose tissue was isolated for primary cell culture. CORT animals had lower body mass than both sham and pair-fed after day 2 (269±7g vs. 302±5g and 310±5g, respectively, on day 10; p<0.01). CORT animals also had more epididymal adiposity than either sham or pair-fed animals (1.07±0.07g vs. 0.72±0.03g and 0.69±0.03g, respectively; p<0.01). Cell culture of the epididymal adipocytes showed a higher rate of basal lipolysis in the CORT animals compared to either sham or pair-fed (55.3±3 vs. 36.1±4 and 40.1±4 uM/g/hr glycerol release, respectively; p<0.05). Isolated epididymal adipocytes were analyzed with microscopy, showing that CORT animals had significantly smaller adipocytes than sham (7.0±0.7 vs 16.6±2.2 nL; p<0.01), but a larger number of adipocytes per mg of tissue (87.3±7.4 vs 36.2±3.5 cells/mg; p<0.01). Ten days of CORT treatment produces more adipose tissue that contains a greater number of adipocytes, but with a smaller average cellular volume. These data suggest that although CORT stimulates lipolysis, the whole tissue undergoes positive adipogenesis. The physiological consequence of this remodelling is unclear but may leave an organism more prone to central obesity and associated metabolic complications when there is a net positive energy balance.

No conflict of interest

P-1565

Bariatric surgery in diabetes: A step towards cure?

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Introduction: Links between obesity and diabetes are well recognized. Bariatric surgery in people with type 2 diabetes (T2D) improves glycaemic control. Bariatric surgery results in significant weight loss that is persistent and maintained long term with improvement in metabolic control in diabetes and other co morbid conditions.

Aims: we assessed following:

1. Weight loss after bariatric surgery
2. Changes in HbA1c after bariatric surgery
3. Impact of bariatric surgery on diabetes medication use

Method: We reviewed the weight loss, diabetes control and medication use in all patients with T2D who had undergone bariatric surgery. Weight, HbA1C, fasting blood glucose and medication use was compared before and 12 months after bariatric surgery.

Results: total of 140 patients had bariatric surgery. 39 patients also had diabetes. These were included in the analysis. Table shows the weight, body mass index (BMI), fasting glucose, HbA1C, and medication use before and 1 year after bariatric surgery in patients with T2D.

	Pre	Post	p
Weight (Kg)	152.1±30	107.6±10.3	<0.0001*
BMI (Kg/sq. m)	54.6±10.3	38.6±7.4	<0.0001*
Fasting Glucose (mmol/l)	9.7±6.6	7±2.2	0.02*
HbA1C (%)	8±1.7	5.7±1.0	<0.0001*
Metformin	23	2	
Sulphonyurea	7	0	
Thiazolidinedione	13	2	
Insulin dose (mean±sd)	122 ±93 (n =11)	14.3±33 (n=2)	0.003*

* = significant

Number of people achieving fasting blood glucose levels < 6, <7 and <11 mmol/l in the pre and post surgery period changed from 10, 15, 25 to 18, 23 and 32 respectively. This indicates that more people were able to achieve euglycaemia after bariatric surgery. Number of people with HbA1C <6, 6.5 and 7% (2, 6 and 13) in the pre and 1 year post surgery were 24, 32 and 36 respectively. Thus out of 38 patients with diabetes who had bariatric surgery 36 achieved glycaemic control at 1 year. Only one patient had Hba1C of 7.4% at one year follow up post operatively.

Summary: Substantial benefits were achieved in severely obese patients with T2D who had bariatric surgery at 1 year follow up, in terms of significant weight loss (68.1%), improved glycaemic control and medication use for diabetes. 90% patients stopping oral agent, 81% stopped insulin (18% reduced insulin

dose). 94.7% patients achieved HbA1C <7% and 86.8% achieved current recommended target HbA1C <6.5% (15.7% in pre operative). Diabetes was "cured" in 86.8% patients achieving HbA1C <6% at one year follow up after bariatric surgery. Patients with higher initial HbA1C had a greater reduction. Weight loss and reduction in HbA1C was linear with time.

Conclusion: Bariatric surgery should be offered to obese people with T2D as it has the potential to cure the disease. Long term follow up is required to see whether this benefit is sustained in long term.

No conflict of interest

P-1566

Serum adiponectin concentrations and cardiac autonomic nervous system modulation in obese children and adolescents

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Aims: Adiponectin is an adipocytokine and represents an important determinant of whole-body sensitivity and cardiovascular disease [i]. Previous studies have shown that variations in serum concentrations of adiponectin have close association with alterations in sympathovagal modulation. Heart rate variability (HRV) is a widely used technique for assessing the sympathovagal balance at the cardiac level. The aim of this study was to evaluate sympathovagal balance and the relationship between serum adiponectin concentrations and index of insulin resistance and secretion (including HOMA%B, HOMA%S, ISIcomp, and TAUC insulin /glucose) in obese children and adolescents (OCA).

Methods: 99 OCA (BMI =p95th) (45 boys 43,3 %, 37.5 % pubertal, aged 10.3±0.1 years, BMI 30.4±0.4 kg/m^2, Zscore BMI 2.3±0.0) were divided in terciles according to ADP: ADP1 (n=33):4.2-10.0 µg/mL, ADP2 (n=33):10.1.-15.4 µg/mL, ADP3 (n=33): 15.5-32.5µg/mL. The sympathovagal balance was assessed by power spectral analysis of heart rate variability at rest condition. All subjects were categorized in terciles of serum adiponectin concentration. Before comparison, continuous variables without normal distribution were log transformed, and arithmetic means are shown. One way ANOVA and multiple linear regression analysis were performed.

Results: Metabolic, cardiovascular and autonomic data according to adiponectin terciles are shown in Table 1.

Table 1. Baseline values after distribution in terciles of fasting plasma adiponectin concentration

	Terciles of plasma adiponectin concentration			
	ADP1	ADP2	ADP3	p- value
Glucose (mg/dL)	86.9 ± 1.7	87.7 ± 1.3	89.7 ± 1.3	0.30
Insulin (mUI/mL)	25.6 ± 2.2†*	15.9 ± 1.3	14.6 ± 1.7	0.001
TAUC insulin /glucose (mUI/mL/120 min)	165.5 ± 16.0†*	109.7 ± 8.1	119.2 ± 11.8	0.02
ISIcomp	2.6 ± 0.3†*	3.8 ± 0.3	4.2 ± 0.4	0.003
HOMA%B	215.5 ± 12.3†*	151.9 ± 8.0	130.7 ± 10.7	0.001
HOMA%S	45.4 ± 3.37†*	72.2 ± 6.5	87.7 ± 8.8	0.001
HR (beats/min)	82.2 ± 2.4	84.8 ± 2.5	79.8 ± 2.1	0.43
Total variance (ms^2)	1395.9 ± 65.2	1476.8 ± 51.6	1454.3 ± 57.0	0.49
Low- frequency power (ms^2)	323.2 ± 9.3	341.8 ± 8.8	348.6 ± 8.0	0.10
High- frequency power (ms^2)	395.8 ± 11.5*	417.4 ± 10.1	436.8 ± 10.5	0.03

TAUC, total area under curve; HR, heart rate. Values are expressed as means ± s.e. †Significant vs tercile 2;*Significant vs tercile 3.

Conclusion: Our results show that lower serum adiponectin concentrations are associated with a sympathovagal balance shift toward a progressive decrease on parasympathetic modulation in obese children and adolescents. This could be associated to earlier cardiovascular disease.

[i] Kadowaki T, Yamauchi T, Kubota N, Hara K, Ueki K, Tobe K 2006 Adiponectin and adiponectin receptors in insulin resistance, diabetes, and the metabolic syndrome. J Clin Invest 116: 1784-1792

No conflict of interest

P-1567

Are Albanians gaining weight - How is the situation five years after the first survey ?

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Background: Obesity today is one of the major burdens for health systems, being one of the primary causes of increasing diabetes, hypertension, cardiovascular disease prevalence. The developing countries, due to the shift in dietary and physical activity patterns, are at increased risk to become overweight or obese, thus fueling the worldwide endemic of Diabesity.

Aim of the study: Determine obesity prevalence in adult population, living in Tirana city (Albania capital) and comparing the results with a previous survey realized in 2001.

Methods: Self-reported weight, height, age, diabetes positive family history and educational degree of Albanian adults, during a screening program for unknown diabetes. The comparison with the data of 2001 study in a cross-sectional survey with 1172 adults aged 25 years or older. All the persons younger than 25 years, known diabetes or uncompleted data were excluded from the statistical analysis of our study.

Results: From 2640 participants, 2206 adults were included in our study (83.6%). M/F 53.7/46.3%. Mean age 50±14.02 years old. Two thirds (66%) of the participants in the study were overweight or obese. The overall obesity prevalence in men was 21.6% and 28% in women (respectively 22.8% and 30.9% in 2001). The most affected age group were middle aged women 55-65 years old with obesity prevalence of 32.1% and men 45-55 years old; 33.9% (28.8 in 2001). The prevalence of unknown diabetes has increased during these years from 2.9% (2001), to 4.07% in 2006.

Conclusions: Overweight, obesity and unknown diabetes are still major public health problems in the adult population of Tirana, and especially in middle aged persons. The same situation is observed in other cities of Albania. The increase of obesity and diabetes prevalence, urge for an immediate National Health Promotion Strategy to prevent this further increase of weight related diseases.

No conflict of interest

P-1568

Obesity and type 2 diabetes increased in Dhaka City

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Background and aims: Bangladeshis are prone to develop diabetes (T2DM), hypertension (sHTN and dHTN) and atherosclerotic heart diseases, which was observed predominantly in the urban population. The prevalence of T2DM was reported 7.9% in 1997. We have undertaken this study to determine whether there was any increase of the prevalence in recent years and also to assess the obesity status in Dhaka City.

Materials and methods: From a total of 90 City Corporation Wards (CCW) in Dhaka City we selected nine randomly. Then, we selected 100 urban households in each CCW. One member (age =25y) from each household volunteered for study. We interviewed each participant about socio-demographic information. We measured height, weight, waist, hip and blood pressure. Body mass index (BMI) and waist-to-hip ratio (WHR) were calculated. Fasting plasma glucose (FPG), total cholesterol (chol), triglycerides (TG) and high-density lipoproteins-c (HDL) were estimated.

Results: Overall, two hundred thirty nine men and 466 women participated. The mean (SD) age was 39.4 (10.9) years, BMI was 21.1 (3.7) and WHR was 0.83 (0.07).). Their mean (SD) FBG was 5.3 (1.97) mmol/l. The crude prevalence of T2DM was 11.2% (M/F = 13.6/10.0) and impaired fasting glucose (IFG) was 9.9% (M/F = 13.6/8.0). There was no significant difference of T2DM between men and women. Although general obesity (BMI =>25) was found in 18% of the participants, 40% of them had central obesity (WHR>=0.85). Compared

with the male the female participants had significantly higher BMI (20.6 v. 22.1, p<0.001); whereas, the males had significantly higher WHR (0.82 v. 0.82, p = 0.02). Interestingly, FBG did not differ between men and women. The diabetic subjects had significantly higher BMI (p<0.05), higher WHR (P<0.001) and higher TG (p<0.05) though cholesterol and HDL-c did not show any difference.
Conclusion: Compared with the previous reports the study revealed an increased prevalence of diabetes and obesity in Dhaka City. Overall, central obesity (higher WHR) was found much higher than general obesity. Compared with the non-diabetic participants, the diabetic subjects had significantly higher WHR and also higher level of TG, but not cholesterol and HDL-c. These findings suggest that central obesity and TG level are important characteristics for differentiating between subjects with and without diabetes.

No conflict of interest

P-1569

Dietary factors and obesity in Japanese-Brazilians: gender differentials

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Aims: Abdominal obesity has been associated with type 2 diabetes and cardiovascular disease. Among the risk factors for abdominal obesity, diet has been considered one of the most important. The aim of this study was to examine which dietary factors are associated with the distribution of body adiposity in Japanese-Brazilians.
Methods: A total of 772 subjects (329 men and 443 women), aged 30-92 years, were evaluated in a cross-sectional population-based survey in Bauru, Brazil. Dietary intakes were assessed using a validated food-frequency questionnaire for Japanese-Brazilians. Measurements of weight, height, and waist circumference (WC, in cm) were taken using the following WHO cut-offs for Asians: overall obesity, Body Mass Index (BMI) ≥25kg/m^2; abdominal obesity, WC ≥90 cm for men and ≥80 cm for women. Logistic regression and linear models were used for comparison between the highest and the lowest tertile of intakes stratified by gender, after adjusting for socio-demographic, lifestyle, biochemical and nutritional confounders.
Results: Among men, beans fiber was inversely associated with abdominal obesity [Odds Ratio (OR) OR=0.27; 95%CI: 0.08; 0.84; $P_{for\ trend}$ = 0.015)] when compared participants in the highest to the lowest tertile. Among men, higher intakes of cholesterol and processed meats were associated with overall with abdominal obesity (OR=3.03, 95%CI: 1.21-7.60, $P_{for\ trend}$ = 0.050 and OR=2.41, IC95%: 1.40-4.15, $P_{for\ trend}$ = 0.188, respectively). Among women, higher intakes of red meats were associated to overall with abdominal obesity (OR=0.50; IC95%: 0.26; 0.98; $P_{for\ trend}$ = 0.121).
Conclusions. Different dietary factors were associated with overall, abdominal, and overall with abdominal obesity according to genders, probably related to differences in dietary patterns.

No conflict of interest

P-1570

Anthropometric conditioning of adiponectin levels' variation in obese premenopausal women after six months in a weight reduction program

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Aims: To evaluate adiponectin levels' variation in obese premenopausal women after 6 months in a weight reduction program; to search for the degree of association between adiponectin divergence and the variation observed for the anthropometric parameters considered.
Methods: We studied 49 obese premenopausal women without a history of any active disease; they were not on any drug therapy other than oral contraceptives. Those women were characterized for BMI, waist circumference, hip circumference, waist:hip ratio (WHR) and a fasting blood sample was collected for adiponectin assessment. They entered in a weight reduction program (diet intervention and physical activity implementation, with or without anti-obesity pharmacological treatment) and all parameters were reassessed 6 months later. No other drug treatment was initiated during that period. We looked for associations of basal adiponectinemia with anthropometric parameters. We studied the percentage variation observed in adiponectin and in anthropometry and searched for eventual correlation of adiponectin variation with the variation observed in each anthropometric parameter. Statistical analysis was performed with the SPSS program, version 16.0. The established limit for statistical significance (p) was 0.05.
Results: Women were characterized by mean age=34.9 ±7.9 years, BMI=44.1±8.8 Kg/m^2, waist circumference=119.2±13.4 cm, hip circumference=134.6±13.9 cm, WHR=0.89±0.07 and adiponectin=6.61±2.9 µg/ml. Basal adiponectin levels varied inversely with waist and directly with hip circumferences, although in a non-statistically significant way. However, a significant inverse association existed between adiponectin and WHR (p<0.001; r=-0.574). After 6 months, we verified a significant increase in adiponectin levels (p=0.01) and a significant decrease in BMI (p<0.001), waist circumference (p<0.001), hip circumference (p<0.001) and WHR (p=0.02). Percentage parameters' variations were as follows: adiponectin=+21.45±41.15%, BMI=-6.87±8.73%, waist circumference=-5.13±7.12%, hip circumference=-3.73±4.96% and WHR=-1.51±4.61%. Percentage adiponectinemia variation was inversely and significantly correlated with percentage waist circumference (p=0.024; r=-0.321) and WHR (p=0.003; r=-0.416) variations.
Conclusion: More than their dependency on the total amount of fat mass, adiponectin levels are directly dependent on the pattern of fat distribution. Although they globally present a considerable decrease in excessive fat mass, we verify a broad spectrum of anthropometric parameters' variation for obese premenopausal women in weight loss programs. The decrease in fat mass is accompanied by a tremendous increase in adiponectin levels, particularly if the loss in central deposits exceeds by far losses in peripheral fat.

No conflict of interest

P-1571

Impact of three different approaches on obesity prevention and management in school children including adolescents

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Aim: To compare three different approaches towards obesity reduction in school children including adolescents.
Methods: In the first approach, students were invited to a Diabetes Educational Fair conducted by the Agra Diabetes Forum in which they received didactic lectures as well as were the audience for skits, monoplays, adapted popular lyrics, poems, couplets and participated in poster competitions, slogan competitions, drawing cartoons. In the second approach, the members of the forum visited schools repeatedly and in association with the teachers of the schools gave lectures and encouraged students to participate in quizzes, debates, elocution contests, tiffin competitions, slogan, cartoon and poster competitions over a 12 month period. In addition in this approach the students were submitted to measurements of height and weight, and a survey of attitudes before and after this period. In the third approach, the offspring of diabetic couples, a known high risk group were subjected to counseling after being invited to a diabetes clinic camp, under a long-term prospective intervention study, APIDS, the Agra Preventive Intervention in Diabetes Study initiated in 1997.
In each case the impact of the intervention was sought to be assessed particularly in obese children.
Results: Overall there was a definitive increase in awareness of healthy life style components in each of the three approaches.Each approach had its distinctive limitations, and also advantages. Overall about 30 % of an obese sample showed a decreased BMI one year after intervention but the limitations of simple BMI measurement were also apparent.The conflictiong demands of the book learning oriented education and competition selection system on adolescent time, as well as the impact of the joint family system as well as the westernization of life style advertisements blitz were also analysed.
Conclusions: Each of the three approaches to obesity prevention and control has distinctive advantages but the overall success rate over a short period is limited by various factors in the socioeducational milieu which need to be

addressed,particularly the demands of examinations and competitions for admission to institutions of higher learning.

No conflict of interest

P-1572

TNF-alpha signaling in adipose tissue of patients with chronic obstructive pulmonary disease is modified by low BMI

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Rationale: Low grade systemic inflammation represents one possible mechanism underlying the development of cachexia and metabolic impairment in chronic obstructive pulmonary disease (COPD). Increases in circulating tumor necrosis factor-alpha (TNFa) and decreases in whole body insulin sensitivity (IS) were observed in cachectic patients in some but not all studies. Thus, we investigated expression of proinflammatory cytokines related to TNFa signaling in subcutaneous adipose tissue (SAT), circulating levels of TNFa and IS in COPD patients with different BMI.

Methods: Thirteen patients with stable COPD and overweight (BMI 28.7±1.4 $kg.m^{-2}$, age 61.5±2.3 yrs, mean FEV_1 58.1±6.5%, SaO_2 93.7±0.6%) were compared to 7 patients with low BMI (17.9±0.2 $kg.m^{-2}$, age 61.8±2.6 yrs, mean FEV_1 24.5±1.7%, SaO_2 88.7±2.5%). Samples of SAT were obtained by percutaneous biopsy. Gene expression profile of 84 genes encoding the TNFa ligands and receptors was determined using the RT^2PCR array. Insulin sensitivity was measured by euglycemic hyperinsulinemic clamp; (1 mU/kg.per min.for 3 h) and fat mass by bioelectrical impedance (Bodystat, UK).

Results: Patients with low BMI had higher insulin sensitivity (M 4.2±0.6 vs. 7.5±0.5 mg/kg/min p <0.005) and unchanged circulating levels of TNFa when compared to patients with overweight. However, SAT of patients with low BMI had increased expression of the proinflammatory TNF soluble factor 4 (0.027±0.011 vs 0.038±0.013 a.u., p=0.056), CD40R (2.100±0.674 vs 3.687±2.175, p=0.021), TNFa receptor associated factor 2 (TRAF2) (0.864±0.306 vs 1.300±0.352, p=0.012), decoy receptor 3 (0.114±0.041 vs 0.193±0.069, p=0.005), and MAPK8 (5.655±2.114 vs 9.124±2.652, p=0.006) and reduced expression of the anti-inflammatory and anti-atherogenic RANK (0.151±0.117 vs 0.058±0.048, p=0.048) and osteoprotegerin (0.667±0.386 vs 0.256±0.237, p=0.028). In addition, circulating TNFa levels were not associated with any of the aforementioned parameters of TNFa signaling in SAT.

Conclusions: Low BMI is in patients with stable COPD associated with increased expression of several proinflammatory and atherogenic TNFa ligands and receptors, as well as with concomitant reductions in the expression of anti-inflammatory and anti-atherogenic adipokines in SAT. Interestingly, the aforementioned changes were not accompanied by increased circulating level of TNFa or with an impairment of the whole body IS. The above indicates that the severity of the lung function impairment is not yet accompanied by whole body metabolic disorder in our COPD cohort.

No conflict of interest

P-1573

To evaluate waist circumference-height ratio as a measure of central obesity and its association with cardiovascular risk factors in type 2 diabetes patients

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Aim: To evaluate Waist Circumference-Height Ratio as a measure of central obesity and its association with cardiovascular risk factors in type 2 diabetes patients.

Methods: Randomly selected 450 adults more than 20 years of age with type 2 diabetes (T2DM) were assessed for the presence of pre-existing cardiovascular risk factors including hypertension, coronary artery disease (CAD) and dyslipidemia. Measurements of anthropometric variables and blood pressure were recorded and fasting blood samples were obtained for measuring lipids. Patients on statin therapy were excluded from assessment for lipids and remaining sample of 254 patients (158 men and 96 women) was analysed for prevalence of lipid abnormalities and its correlation with waist-height ratio. Body Mass Index (BMI), waist-hip ratio (WHR), and waist circumference-height ratio (WC-HR) were calculated. Pearson's correlation coefficients (r) of WC-HR with other measures of obesity and risk factors were determined. Quartiles of WC-HR were calculated and parameters of hypertension, CAD, triglycerides, LDL- and HDL-cholesterol were plotted against each quartile to analyze the trends.

Results: After exclusion of 41 patients with incomplete data, 409 patients with type 2 diabetes were taken up for the study. Patient sample included 248/409 (60.64%) men and 161/409 (39.36%) women in the age group 23 – 83 years. A total of 373 (91.2%) patients were overweight or obese, with 88.31% men and 95.65% women being overweight (BMI>23)and 183/248 (75.81%) men and 144/161 (89.44%) women obese (BM>25). Waist circumference (WC) and WHR were increased (WC>90cm for men and >80 cm for women, WHR>0.9 for men and >0.8 for women) in 155/161 (96.67%) and 152/161 (94.41%) of women and 202/248 (81.5%) and 224/248 (90.3%) of men respectively. WC-HR more than 0.55 was present in 191/348 (77.02%) men and 149/161 (92.55%) women. WC-HR showed a strong correlation (r) with BMI (0.79) and WC (0.86). It, however, showed a weak correlation (0.28) with WHR. Correlation (r) with hypertension (0.14), CAD (-0.02), triglycerides (-0.02), LDL-C (-0.03) and HDL (0.03) was poor. Trend analysis did not show any increase in prevalence of hypertension, CAD, triglycerides, LDL-C or HDL-C with increasing WC-HR.

Discussion/conclusions: Recent studies from Asian and Indian populations have reported waist-height ratio to be a good surrogate for measuring central obesity and a strong predictor of type 2 diabetes and cardiovascular risk.

Our study shows that waist circumference-height ratio (WC-HR) is a good surrogate measure of obesity and central adiposity in patients with type 2 diabetes. However, it does not show any correlation with prevalence of cardiovascular risk factors in this subset of population.

No conflict of interest

P-1574

Weight profile of newly diagnosed Indian type 2 diabetes (T2D) patients attending Primary Care Rendering Diabetes Clinic

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Aims and objectives: Indian T2D patients present with several special characteristics compared to their counterparts in western countries. For instance, onset of diabetes is approximately 10 years earlier and they often present with "lean obesity," a condition when weight is normal, as per BMI, but body fat percentage is higher. The present study aimed to classify Indian T2D patients as per BMI, fat percentage and waist circumference, using commonly accepted cut off points, applicable for Indian subjects. BMI was considered normal between 18.5 to <23 kg/m^2 for both men and women, body fat percentage for men <25 and for women <30 was regarded normal and waist circumference ≤90 cm for men and ≤80 cm for women was taken as normal.

Methods: Sixty consecutive newly diagnosed T2D patients of both sexes (30 each), attending our outpatient unit, were included for the present study. Various anthropometric measurements were taken such as age, height, weight, BMI, waist circumference and body fat percentage. Their baseline characteristics were as follows:-

Observations: Analysis of data led to following categories of weight status, as shown in tables:

see table on the next page

Characteristic	Total	Female	Male
Age (yrs)	49.81± 6.05	49.73±5.72	49.90±6.46
BMI (kg/m^2)	29.30±5.82	29.58±6.10	29.03±5.61
Body Fat (%)	32.26±4.79	32.75±5.19	31.77±4.39
Waist circumference (cm)	98.26±8.44	96.08±9.21	93.89±9.58

As per BMI & Fat %	Total		Male		Female	
	N=60	%	N=30	%	N=30	%
Normal Non obese	2	3.33	1	3.33	1	3.33
Normal obese	4	6.66	3	10	1	3.33
Over Wt non obese	8	13.33	0	0	8	26.66
Over Wt obese	23	38.33	15	50	8	26.66
Class 1 obese	13	21.66	8	26.66	5	16.66
Class 1 non obese	2	3.33	0	0	2	6.66
Class 2 obese	3	5	1	3.33	2	6.66
Class 3 obese	5	8.33	2	6.66	3	10

As per BMI & Waist Circumference (WC)	Total		Male		Female	
	N=60	%	N=30	%	N=30	%
Normal Wt+ Normal WC	1	1.66	1	3.33	-	-
Over wt+ Normal WC	1	1.66	1	3.33	-	-
Obese+ Normal WC	3	5	3	6.66	-	-
Over wt+ - WC	32	53.33	14	46.66	18	60
Obese+ - WC	23	38.33	11	36.66	12	40

Results: Majority of the Indian patients (38.33%), both men and women, belonged to the category of Overweight–Obese at the time of diagnosis of T2D. This was followed by class I obese (21.66%). Class III obesity was quite rare (8.33%) in Indian patients. Observations based on waist circumference also corresponded with body fat percentage, as majority (53.33%) of the overweight T2D patients had increased waist circumference.
Conclusions: Majority of Indian T2D patients are not obese at the time of diagnosis; most being overweight only.

No conflict of interest

P-1575

Does therapy with H2 receptor antagonists have an effect like gastric bypass surgery in treatment of obesity

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Background and aims: Many studies showed that gastric bypass surgery (GBP) has important place in therapy of obesity and in control of insulin secretion. GBP has been reported to inhibit appetite and gastric motility. Decreased plasma concentrations of ghrelin and increased concentrations of GLP 1, augmented after GBP, are the most prominent candidates for this effect. Maldigestion can be also caused by the absence of acid and pepsin secretion. The aim of this study was to examine the effects of using ranitidine hydrochloride (selective H2 receptor antagonist) in the treatment of obesity.
Materials and methods: We examined 26 healthy obese persons (BMI >30 kg/m^2), mean age 42.1 ± 10.1 years. All patients came to endocrinologist only because of their problem with obesity. Three months before this study all patients have already been on therapy with the low calories diet and physical activity, but they didn't succeed to reduce their body weight. In this study the patients continued with the same diet and physical activity and in addition they were given to take daily two tablets of 150 mg ranitidine (morning and evening) for the next eight weeks. At baseline and after 8 weeks period we determined body weight, waist circumference (WC) and BMI (kg/m^2), lipid status (total cholesterol, triglycerides, HDL cholesterol and LDL cholesterol). Also a 2 hours 75-g oral glucose tolerance test (oGTT) was done during which we followed plasma insulin concentration (by radioimmunoassay) at the beginning and after one hour of the test (60').
Results: At the end this study has shown that all patients have significantly reduced their body weight from 2 to 23 kg, mean 7.2±4.6 kg (103.1±14.1 vs 95.9±13.5 kg, p<0.01), BMI (36.8±4.9 vs 34.2±5.1 kg/ m^2, p<0.01) and WC (108.4±9.3 vs 99.6±10.2 cm, p<0.01). Also, they had better lipid status with significantly reduced triglycerides (2.2±0.9 vs 1.7±0.7mmol/l, p<0.05) and increased HDL cholesterol (1.1±0.3 vs 1.3±0.3 mmol/l, p<0.01). Fasting plasma insulin was improved (10.1±5.2 vs 10.3±4.9, NS) and insulin secretion after 60'of oGTT was significantly reduced (76.2±41.5 vs 58.1±37.6, p<0.05).
Conclusion: Potential explanation for our findings is that ranitidine has effects like gastric bypass surgery on gut hormones that control insulin secretion (GLP-1, PYY, Ghrelin). All patients also could maintain the advised dietary programme with pleasure and without being hungry, nervous or depressed.

No conflict of interest

P-1576

BMI as risk factor for type 2 diabetes and hypertension: the height and waist problem

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Aims: Obesity, defined by BMI and waist, is a risk factor for type 2 diabetes and hypertension. There are publications showing lower risk of metabolic syndrome and vascular events for high height. We have analyzed the influence of height and waist on hypertension and type 2 diabetes in the epidemiological study.
Methods: Representative sample of 2058 adults of Czech republic was examined in December 2008 - measuring of weight, waist and height and interview. χ^2 test was used to compare categories of BMI, waist and age. Correlations of BMI to weight, height and waist was calculated
Results: Mean BMI of men was 26.9, mean BMI of women 26.1 kg/m^2, mean height 178cm in men and 167 cm in women, mean waist 94 cm in men and 85 cm in women. Prevalence of diabetes in the sample was 7%, overweight 22%, obesity 34% and hypertension 21%. There is a higher relation of diabetes to obesity in women: 25% diabetics in women and only 15% diabetics in men. Both diabetes and hypertension are waist dependent and there is no difference between sexes. In men 40% prevalence of hypertension and 15% prevalence of diabetes was present in waist above 102 cm. In women 39% prevalence of hypertension and 16% prevalence of diabetes was present in waist above 88 cm.
In both sexes there is a negative relation of hypertension and diabetes prevalence to height. Hypertension prevalence 32% in men below 172 cm and 11% above 186 cm height. Hypertension prevalence 33% in women below 161 cm and 12% above 172 cm height. Diabetes 13% in men below 172 cm and 3% above 186 cm. Diabetes prevalence 11% in women below 161 cm and 3% above 172 cm.
Positive correlation (p <. 001) of BMI to weight (0.854), and waist (0.787) was found and negative correlation (p < .001) to height (-0.058) was found.
The correlations were recalculated using the survey with same methodology from the year 2000 in 1627 subjects: Positive correlation (p < .001) of BMI to weight (0.990), waist (0.262) and height (0.325) was found. The prevalence of obesity increased from 15 to 22% and of overweight from 31 to 34%.
Conclusion: Our data support the idea that BMI and waist are risk factors for hypertension and type 2 diabetes using the different waist criteria for men and women defined by IDF. The prevalence of diabetes in women is more BMI dependent. In both sexes was shown that low body height is a risk factor for diabetes and hypertension today. BMI is therefore not a good universal diabetes risk marker for men and women and for high and low body height. In last 8 years the BMI-waist positive correlation is more pronounced and a new negative BMI-height correlation occurred. This indicates that the BMI-height relation is influenced by social factors rather than by biological factors and mathematical BMI formula.

Conflict of interest:
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P-1577

Plasma adiponectin levels in normal weight obese, non-obese and obese Indian type 2 diabetic subjects

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Background: Persons with a normal Body Mass Index (BMI), but a high body fat percentage (BFP),now termed normal weight obese (NWO) are very prone

to have a poor cardiac & metabolic profile.
Adiponectin is predicted to contribute to peripheral insulin resistance.
Since NWO represents high body fat composition in apparently non obese individuals & is strongly associated with a higher risk of vascular inflammation probably more so in diabetic subjects, low adiponectin levels could be the missing link between these two clinical entities.
Aim: Comparison of Plasma adiponectin levels & other metabolic parameters among NWO, Non-Obese & Obese type 2 diabetic subjects.
Methods: 70 male, well controlled, type 2 diabetic subjects with normal ECG, not on Thiazolidinediones, were enrolled. They were matched for age, duration of diabetes (DM) & glycemic control. Demographic data, anthropometry [BMI, BFP, Waist Hip Ratio (WHR)], glycemic control & Plasma adiponectin levels (ELISA, globular & full-length) were recorded. The subjects were grouped as Obese (BMI ≥25 kg/m^2)* & non-obese (BMI <25 kg/m^2)*. The non-obese group was divided as NWO (BFP ≥20%) & normal weight non obese (BFP <20%).
**Asia Pacific guidelines*
Results: Only 17% of subjects had normal BMI & BFP, whereas 46 % were frankly obese & 37% were NWO indicating a combined high prevalence (83%) of obesity.
Mean BMI in the Obese, NWO, Non-obese groups was 29.03± 2.89, 22.46±1.25, 21.19±2.04 respectively. Mean BFP in the corresponding groups was 43.60±10.01, 39.81±7.16, 15.30±2.8.
Family history of DM was significantly more in the NWO group (58%) than in the Obese group (46%). (P = 0.041)
Glycemic control (HbA1c & FPG) was best in the non-obese group, followed by NWO & then obese groups. Obese group had significantly higher FPG compared to NWO group. (P = 0.0117)
Waist circumference (WC) & WHR was maximum in obese (WC = 107.25±12.98, WHR=1.00± 0.05) subjects, followed by NWO (WC = 95.85± 7.37, WHR=0.90± 0.03) & was least in non obese (WC = 81.33±3.26, WHR=0.87± 0.04) subjects.
The prevalence of microvascular complications in the 3 groups was not significantly different, possibly due to similar glycemic control & duration of DM.
Obese group had the lowest value of adiponectin (6.43±2.47 ng/dl), followed by NWO group (10.60±2.42 ng/dl). Non-obese group had the highest value (13.72±2.99 ng/dl).
There is significant difference between adiponectin levels of NWO & Non-Obese groups (p = 0.001).
Conclusion: There is a very high prevalence of obesity (by BMI & BFP) in the Indian diabetic population.
The adiponectin levels in the NWO Group veer more towards the Obese group reflecting the importance of diagnosing & treating this subgroup of patients. Nutrition therapy in NWO diabetics has to address fat loss specifically.

No conflict of interest

P-1578

Family and childhood obesity

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Poor family functioning will be associated with inadequate parental monitoring and/or regulation of children's eating and activity patterns. We aimed to examine the relationship between a child's weight and a broad range of family and maternal factors.
Methods: This cross-sectional study involved 56 obese children (m/f =30/26), mean age11.05±3.50 yrs, and 56 mothers. Obesity was defined as BMI scores at or above the 97th percentile for age and gender. Psychological examination was conducted (Eidemiller test of house education) and eating attitudes test (EAT-26). All the analysis were performed with the Statistics 6.0 software, p-value < 0.05 was accepted as statistically significant. ANOVA test was used for unpaired data. BMI mother's 27.90±5.33 (19.00-41.00) kg/m^2, BMI children's 27.84±4.6 (18.20-39.60) kg/m^2, SD BMI 5.14±1.92. Results: 17.86% mothers had secondary education, 57.14%-higher education and 25%- special education. The full families were observed in 71.43%, incomplete - in 28.57% examined patients. BMI children was not correlated with BMI mothers ((r>0.1). Differences SD BMI were received depending on mothers education: high - Me 4.77 [3.24-5.44] and secondary-special - Me 5.67[4.68-7.20] (r=0.0085). The significantly differences of the following criterion of the test were determined on deflection SD BMI from Me: "forbid-requirements overweening" (r=0.1), "sanctions overweening" (r=0.015), for girls «projection male quality" (r=0.045). On the other criteria of the test differences between SD BMI were not revealed (r>0.1).By analyzing EAT-26 following data were received: gender differences breaches of the eat behavior, concerned with own body. The dissatisfaction of children's need can lead to breach of the eat behaviour in boys (r=0.7). Children's psyche can catch any uncertainty in parents correctness of the education and his place begins to occupy society (r= 0.6).On the other hand than more projection male quality on boy, that more he reveals self-verification (r=0.6). Following results were received in the female-group. The self-verification turned out to be most labile factor. We were received The negative correlations: factor hyper patronage (r=-0,5), satisfaction of requirements (r=-0.6), requirements insufficient (r=-0.61), unsteadiness of the education styles (r=-0.52).The lack of development of the parental feeling (r=0.56), overweening requirements (r=0.6), projection on child undesirable quality (r=0.6).
Conclusion: Findings indicated on increase the children BMI under using negative acceptance in household education. It was revealed that mothers had difficulties between need of the checking and granting autonomy to the child.

No conflict of interest

P-1579

Perception of obesity among adult women in Limbe urban area (Cameroon)

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Introduction and Aim: It is a fundamental need, it is a fundamental right to eat, yet it has also been observed in developing urban area that many people who are apparently obese are not aware of the problem and the factors that cause it. Many seem not to know that their eating behaviour influences their health. Between January and April 2006, women's perceptions on obesity were assessed from various household quarters in Limbe urban town.
Method: Overweight and obesity were defined according to BMI grade system of obesity lay down by the WHO. We used a questionnaire filled by 100 adult women (aged 18-65) randomly selected from middle-income household and high-income household quarters.
Result: Mean BMI per intervals of classification was 28.3. The greatest prevalences of overweight (36%) and obesity (55%) were found among women from monogamous marriages.
Housewives (32%), working women (29%) and 'buyam sellam' women (26%) recorded high prevalence of obesity. No case of obesity was recorded among farmers.
Overweight was more prevalent among the high-income households (46%) but obesity recorded the highest percentage (34%) among the middle-income households.
Most respondents (45%) related obesity to fat; 20%defined it as a result of overeating only 24% identify it as a disproportion between height and weight. Few women (27%) view lack of food intake control as an exposure factor to obesity. 95% of respondents acknowledged that fatty foods can predispose to obesity. The appearance and the taste of the food is for 35% of women a factor that triggers appetite. 37% of women always check the amount of oil in food before they eat. The provision of a fruit at each meal accounted for only 28% of the eating behavior as well as eating at scheduled times.
Among the respondents who did not view themselves as being obese, 61% was overweight and 30% was obese.
Control of diet, avoidance of sedentary life and performance of physical exercise were identified as preventing measures by 70% of respondents. 65% affirmed that a control of diet implies an intake of less fatty and sugary foods, an intake of plenty fruits and reduced quantity of starch intake.
Only 8% of women were engaged in sporting activities more than one time per week, with a significant 55% practicing sport occasionally.
Conclusion: The knowledge on behavioral factors related to overfeeding does not influence many women in developing urban area to control their weight as we had a population of 34% overweight and 32% obese regardless of occupations and households. Overweight being much perceived as a sign of well being or "peace of mind", we need a wider scale to identify the impact of risk factors of obesity on women's health to sensitize the population on dangers caused by excess weight gained.

No conflict of interest

P-1580

Neck circumference as an upper body obesity index, and its relationship with cardiovascular risk factors

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Background and aims: This study aimed to evaluate neck circumference (NC), as an upper body obesity index, and its relationship with cardiovascular risk (CVR) factors, considering that it would be a simple and time-saving measure to identify overweight/obese, and high risk patients.
Materials and methods: We evaluated 114 Brazilian adults (27 men, 87 women), 55 with metabolic syndrome (MS) and 59 without MS (NMS) (IDF criteria). Main indicators studied included NC, waist circumference (WC), BMI, waist to hip ratio (WHR), systolic (SBP) and diastolic blood pressure (DBP), fasting serum lipoprotein, glucose, insulin, uric acid (UA), alanine aminotransferase (ALT), arginine aminotransferase (AST) levels, glucose and insulin levels 2 h after 75-g OGTT, and HOMA.
Results: NC mean was 36.2±3.3 and 34.2±2.8cm (p=0.01) in the groups MS and NMS, respectively. Among women NC was 34.7±1.9 and 33.2±2.1cm (p=0.002), and among men was 39.8±3.0 and 38.0±2.1cm (p=0.09) in the groups MS and NMS, respectively. Other measurements in MS and NMS were, respectively: WC=99.5±9.9, and 91.0±10.6cm (p=0.01); BMI=30.9±5.0 and 28.0±4.4kg/m^2 (p=0.02); WHR=0.95±0.07 and 0.88±0.06 (p<0.0001); SBP=127.6±19.8, and 115.9±11.3mmHg (p=0.04); DBP=82.9±11.2, and 77.9±7.3mmHg (p=0.16). Lab parameters in both MS and NMS groups were, respectively: UA=5.3±1.5, and 4.3±1.1mg/dL (p<00001); AST=22.1±7.4, and 19.9±5.9 U/L (p=0.08); ALT=25.3±14.0, and 22.0±18.3U/L (p=0.3); total cholesterol=198.0±51.0, and 189.0±36.0mg/dL (p=0.2); LDL-Chol=111.9±33.6, and 114.4±32.0mg/dL (p=0.6); HDL-Chol=41.8±11.0, and 50.4±10.6 mg/dL (p<0.0001); triglycerides=189.8±83.7, and 106.7±28.6mg/dL (p<0.0001); fasting glucose=106.3±24.3, and 90.9±8.8mg/dL (p<0.0001); fasting insulin=13.1±5.9, and 10.0±12.0mU/mL (p=0.09); post OGTT glucose=155.5±59.8, and 114.2±32.1mg/dL (p<0.0001); post OGTT insulin=101.4±71.6, and 74.6±74.3mU/mL (p=0.06); HOMA=3.4±1.6, and 2.2±2.5 (p=0.008). Pearson's correlation coefficients indicated a significant association between NC and: WC (MS r=0.65; NMS r=0.53; p<0.0001), BMI (MS r=0.48, p<0.0001; NMS r=0.36, p=0.008), WHR (MS r=0.59, p<0.0001; NMS r=0.41, p=0.003); UA (r=0.40 p=0.003), ALT (r=0.27 p=0.04) and HOMA (r=0.32 p=0.025) in the MS group; UA (r=0.49 p<0.0001), AST (r=0.36, p=0.005), ALT (r=0.57, p<0.0001) and HDL-Chol (r=-0.29, p=0.02) in the group NMS.
Conclusion: NC is positively correlated with main factors of the metabolic syndrome, therefore with increased risk of cardiovascular disease.

No conflict of interest

P-1581

Effect of guideline choice on the prevalence of central obesity in Nigerians with type 2 diabetes

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Background: The presence of central obesity in patients with type 2 diabetes (T2DM) impacts significantly on the management of the disease and its co morbidities. Different cut off points by various research groups have led to confusingly different prevalence data.
Aim: To compare the prevalence of central obesity using various criteria in Nigerians with T2DM.
Methods: A retrospective study of outpatients of a diabetes clinic in a tertiary health care centre was done. Data obtained from the clinic notes of the patients included the age, gender, DM duration, presence of hypertension, waist (WC) and hip circumferences. The waist hip ratio (WHR) and body mass index (BMI) were appropriately derived. Central obesity was defined according to the following: WHO (WHR > 0.90 in men, ≥0.85 in women), IDF specific values for Europids (WC ≥94 cm in men and ≥80 cm in women) and NCEP ATP III (WC ≥102 cm in men and ≥88cm in women). The results are expressed as mean (SD) and frequencies. Pearsons correlation coefficient was used to determine the relationship between the indices. The level of statistical significance was set at p value = 0.05.
Results: There were 568 persons studied, 260 (45.8%) were males and 308 (54.2%) were females. The mean ages of the male and female patients were 58.4 (9.9) and 57.3 (9.6) years respectively (p=0.14), while the mean durations of diabetes in the male and female patients were 5.8 (6.8) and 6.1 (8.7) years respectively. The frequencies of central obesity using the WHO, IDF (Europids) and NCEP ATP III criteria were 213 (81.9%), 128 (49.2%) and 56 (21.5%) in males and 263 (85.4%), 283 (91.1%) and 227 (73.7%) in females. BMI had a stronger correlation with WC in males than in females (r=0.49, p<0.00001 and r=0.35, p<0.00001). All the guidelines showed higher prevalence of central obesity in women with diabetes than men with diabetes but the difference was particularly marked using the IDF criteria.
Conclusion: The WHO criteria gave the highest prevalence rate for central obesity in the entire study population followed by the IDF (Europids specific values) and then the NCEP ATP III. There is great disparity in the prevalence rates of central obesity in the diabetic Nigerian males and females using current international guidelines. Further studies are necessary to determine which criterion is best for defining central obesity in sub-Saharan Africans especially in the female population.

No conflict of interest

P-1582

The effectiveness of population health interventions for the prevention of type 2 diabetes, a systematic review

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Context: Tackling the burden of chronic disease requires advocacy for preventive interventions to advance the well-being of patients, communities, and populations. A summary of the effectiveness of population health interventions to prevent diabetes is valuable for decision makers seeking information on reducing the growing health burden and costs of diabetes.
Background: Diabetes is a major public health problem, in Canada and worldwide. While there is evidence on strategies for the prevention, management, and treatment of diabetes, few studies focus on universal or 'whole of community' population health interventions addressing the social determinants of health
Objective: To evaluate the effectiveness of population health interventions to prevent type 2 diabetes through a systematic review of literature.
Search strategy: Building upon a review of the evidence to 2002, eight electronic databases were searched from 2003-2006. 'Related articles' of included studies were located through PubMed.
Selection criteria: Included studies must: describe an intervention (a) designed for the primary prevention of type 2 diabetes (or related risk factors); (b) be implemented 'universally' rather than targeting those at high risk; and (c) address at least one social determinant of health (e.g. physical environment).
Data collection: Two reviewers independently screened, extracted data, and assessed study quality. Standardized tools were used for quality assessment. Discrepancies were resolved by consensus or a third reviewer.
Results: 47 population health interventions were identified in total. Eight have yet to report outcome data. Of the remaining 39 interventions, 23 took place in schools, 10 in communities and 6 in worksites. All but four studies showed significant impacts on at least one diabetes related risk factor. Studies included were diverse in terms of design, quality, target population, theory employed, and outcome measures reported. Effectiveness data was summarized in an adaptation of a harvest plot depiction.
Conclusions: Evidence suggests that population health approaches can reduce the risk of diabetes. As no pattern in the relationship between intervention setting and outcome achieved was evident, a realist review of the interventions, by setting, may provide further insight into what can be done to reduce the risk of diabetes.

No conflict of interest

P-1583

Metabolic profile and adipose tissue distribution

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The objective was to analyze the impact of visceral fat in patient's metabolic profile. For that, we evaluated ambulatory patients from an endocrinology clinic in Sao Paulo, Brazil. This prospective study was done during five months in 2007. It was selected non-diabetic subjects, with body mass index (BMI) = 30 Kg/m2. It was excluded those who were using metformin, anorectics or acetoacetamide-N-sulfonic acid. They were investigated about the presence of risk factors for DM2, like patients above 45 years of age, hypertension, family Type 2 Diabetes Mellitus history, prior history of fetal macrosomia and/or gestational diabetes. According to the WHR, the patients were divided in two groups: WHR > 0,9 and WHR < 0,9. These groups were compared, correlating laboratory parameters and the presence of risk factors for DM2. Fasting plasma glucose (FPG) and insulin levels, alanine aminotransferase (ALT), total cholesterol and its fractions, triglycerides and C-reactive protein were measured. Insulin resistance (IR) was evaluated by the homeostasis model assessment (HOMA)-IR. It was evaluated 101 patients, 72 female, age 35,8 ± 12,1 in the group WHR < 0,9 and age 42,6 ± 9,7 in the group WHR > 0,9. In the group WHR < 0,9, 13 patients presented three or more risk factors for DM2 and in the group WHR > 0,9, 19 patients presented this condition, without statistical significance. Alanine aminotransferase levels were higher in the group WHR >0,9 (p=0,097), as well as, FPG (p=0,088) and HOMA (p=0,075). To conclude, we could say that central fat accumulation may cause hepatocellular injuries, with increasing levels of ALT, that are correlated with an impaired IR as represented by HOMA-IR. It is important to stimulate the patients get thin, seeing that adipose tissue also has endocrine function that may cause an increased cardiovascular risk.

No conflict of interest

P-1584

Pattern of Body Mass Index (BMI) in Nigerian patients with Diabetes Mellitus

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Aim: To determine the pattern of BMI in patients with confirmed diagnosis of diabetes mellitus in a tertiary health care centre in Nigeria.
Methods: Using the diabetes register of the endocrine and metabolic unit of the Lagos University Teaching Hospital, Nigeria, data extracted for this analysis included the age, gender, type of diabetes, weight, height, blood pressure status, and duration of diabetes. BMI was computed using the standard formula. BMI was classified according to the WHO criteria as follows: underweight < 18.5kg/m^2, normal BMI 18.5-24.99 kg/m^2, overweight 25-29.99 kg/ m^2, class I obesity 30-34.99 kg/ m^2, class II obesity 35-39.99 kg/ m^2, class III obesity = 40 kg/ m^2. Statistical analysis was done using descriptive methods to provide means (SD) and frequencies (%). The level of statistical significance was set as p value = 0.05.
Results: There were 1503 patients with diabetes included in the analysis, consisting of 574 (54.5%) females and 479 (45.5%) males. Thirteen (1.2%) patients had type 1 diabetes and 1040 (98.8%) patients had type 2 diabetes. 55.3% of the patients had hypertension. The mean age of the study population was 54.0 (12.7) years. The mean BMI was 26.7 (5.5) kg/m^2 and the mean duration of diabetes was 9.6 (5.7) years. The females were significantly older than the males {55.2 (12.6) vs 52.9 (12.7) years respectively, p= 0.005} while the patients with type 2 diabetes were significantly older than those with type 1 diabetes {31.5 (19.1 vs 54.2 (12.4 years, p=0.00000}. The frequencies of BMI categories in females and males were: underweight 25 (4.4%) and 17 (3.5%), normal BMI 171 (29.8%) and 215 (44.9%), overweight 197 (34.3%) and 178 (37.2%), class I obesity 130 (22.6%) and 61 (12.7%), class II obesity 54 (5.9%) and 7 (1.5%), class III obesity 17 (3.0%) and 1 (0.2%). There was a significant difference in the frequencies of the BMI in the females and the males (chi ^{2}= 56.3, df=5, p=0.0000). The frequencies of BMI categories in the type 1 and type 2 patients were as follows: underweight 2 (15.4%) and 40 (3.8), normal BMI 9 (69.2%) and 377 (36.3%), overweight 2 (15.4%) and 373 (35.9%), class I obesity 0 (0.0%) and 191 (18.9%), class II obesity 0 (0.0%) and 41 (3.9%), class III obesity 0 (0.0%) and 18 (1.7%). There was also a significant difference in the frequencies of BMI categories in the type 1 and 2 DM patients (chi ^{2}= 12.7, df=5, p=0.03).
Conclusion: Type 1 and 2 have different patterns of BMI. Almost all the type 1 patients were either underweight or had a normal BMI while type 2 patients were mostly overweight or obese as have been found in other studies. However, type 2 DM females were more frequently obese or overweight compared to the males, a pattern different from that in other parts of the world but similar to those done in Africans with diabetes.

No conflict of interest

HEALTHCARE AND EPIDEMIOLOGY

Diagnosis and classification

P-1585

Non-invasive method for blood glucose level estimation by saliva

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Aims: Diagnostic devices are available in the market to measure the blood glucose level. However in all available products blood is taken as diagnostic body fluid. So necessity arises to find some non-invasive diagnostic means to measure body glucose level frequently without any discomfort to the patient. Hence, the present study aimed at estimation of blood and salivary glucose level in diabetic and non diabetic subjects.
Methods: Twenty diabetic and twenty non diabetic subjects were randomly selected for this study. A detailed history of each patient was obtained regarding the age, sex, duration of diabetes, associated risk factors, family history and any associated illness. The quantitative estimation of the blood and saliva glucose level were performed by glucose oxidase method, using enzymatic kits (GOD-DAP).
Results: A correlation was observed between fasting saliva glucose level (SGL) and fasting blood glucose level (BGL) of diabetic as well as non diabetic subjects. The correlation coefficient of non diabetic and diabetic subjects were + 0.84 and +0.34 respectively. These values of correlation coefficient proved the correlation of fasting saliva glucose and fasting blood glucose values statistically.
Conclusion: Values observed regarding blood and saliva glucose level were found distinctly difference between normal subjects and diabetic subjects suggesting that monitoring of saliva glucose level can be used as an index of diabetes mellitus. With further studies on the correlation between diabetic mellitus and SGL, it is believed that not only noninvasive BGL estimation becomes possible, but early detection of diabetes mellitus becomes a reality by the use of this procedure for screening in medical check.

No conflict of interest

P-1586

Classical glucose curve x Oral Glucose Tolerance Test (OGTT)

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Introduction: The American Diabetes Association (ADA) created a new method for diabetes diagnosis in1997 based on the glucose curve after two hours with 75 grams of glucose, disregarding the 30', 60' and 90' marks.
Objective: To evaluate the glucose curve in a large population group with emphasis on glucose points of 30, 60 and 90 minutes.
Subjects and methods: The classic glucose curves in 1.073 individuals were randomly evaluated. According to ADA criteria, three groups of individuals were selected: 111 diabetics (D), 209 intolerants (I) and 753 normal individuals (N). The groups were analyzed based on the glucose curve incremental area, subdividing the normal individuals into those who presented one glucose peak = 200mg/dL (N1 - 51 individuals), two glucose peaks (N2 - 19 individuals) and no glucose peak (N0 - 683 individuals). Students t-test was used for the statistic analysis.
Results: The incremental area for the groups was the following: N0 - 362.56 ± 157.57 mg/dL/min (x ± SD), N1 - 663.08 ± 151.39 mg/dL, N2- 947.68 ±

214.96, I - 815.97 ± 179.07, D 1,277.35 ± 282.43. The comparison N1 x N0 and N0 x N2 showed difference with statistic meaning (p<0.001).
Conclusion: With these new ADA criteria, patients considered normal (9.29%) showed an incremental area bigger than patients considered intolerant. These results showed that ADA´s criteria for IGT must be reviewed.

No conflict of interest

P-1587

Plantar foot pressure in patients with neuropathic diabetes mellitus

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Aims: Diabetic patients who have neuropathy are at risk of foot pressure ulcers because of the lack of pain sensation in their feet. In this study we assessed the plantar foot pressure in neuropathic diabetic patients and compare their values with normal subjects to find points with higher pressures which are at risk of pressure ulcers. Choosing the best orthotic treatment in these patients should be after this assessment.
Methods: In this cross sectional study, 20 subjects participated. Subjects put in two groups of diabetic (5 men and 5 women) with mean age of 57 years and normal (5 men and 5 women) with mean age of 60 years. We used 2D foot scanner system to assess the foot plantar pressures in 10 different zones under the foot. We asked patients to walk at their normal speed a defined 5 meter pace.
Results: There was significant difference in foot plantar pressure in six zones in comparison between two groups which are Toe 1, Toe 2-5, Meta 1, Meta 4, Meta 5 and Midfoot. In both groups the mean foot plantar pressure was higher in forefoot.
Discussion: The higher foot plantar pressure under heads of metatarsals 3 and 4 and the overall higher foot plantar pressure under the foot of diabetic patients in comparison to normal population is in accordance with similar studies.
Conclusion: Diabetic patients had higher pressures in their forefoot and are more vulnerable to injuries in forefoot. So in orthotic treatment of these patients should choose appropriate materials in forefoot.

No conflict of interest

P-1588

Latent Autoimmune Diabetes Mellitus in Adults (LADA): incidence and profile

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The adequate diagnosis of the type of diabetes in patients with determined clinical characteristics is important to program the treatment and to guide about the gravity in case of acute hyperglycemia. In case of autoimmune diabetes, the early detection of other autoimmune illnesses can even though prevent situations of risk for the patients who attend a course with auto immunity against vital glands. We use in this prospective study, 3 centers of attendance of diabetic individuals, in the period of 18 months and include patients, diagnosed as type 2 diabetes, age 30 years or older. If presence of 2 positives in 5 clinical criterias for autoimmune diabetes suspect, it was requested the levels of C-peptide and Anti-glutamic acid decarboxylase (anti-GAD). Among the 57 patients examined, 11 had confirmed the diagnosis and, therefore, we got a sensitivity of 70% for the clinical criteria. These patients then had been submitted to complete anamnesis and other examinations, in order to determine the profile of Latent Autoimmune Diabetes Mellitus in adults (LADA). The average of age at the LADA diagnosis was of 44.64 years, the majority of the diagnoses patients had been of male sex (72.73%). Most prevalent clinical criteria was the presence of acute symptoms at the diagnosis, followed by age < 50 years and BMI <25 kg/ m2.
The average for beginning insulin after the diagnosis of diabetes was 7 years, and those that had initiated insulin more precociously presented values of C-peptide smaller on the LADA diagnosis (0,36ng/ml X 2,16ng/ml); with 95% confidence interval and p=0,0016 by Student-t distribution. The anti-GAD levels were similar in the 2 groups. The most prevalent associated illness to diabetes in these patients was the dyslipidemia, and the diabetic chronic complication more found was the peripheral neuropathy. About the association with other autoimmune illnesses, the presence of thyroid illness was more prevalent, in the form of Hashimoto disease, followed by Graves's disease. We still identify cases of alopecia, vitiligo, pernicious anemia, auto immune hypogonadism, mucocutaneous candidiasis, no case of hypoparathyroidism or celiac illness was identified, and no patient of this study had criteria to Polyglandular autoimmune syndrome (PGA) type I or II.

No conflict of interest

Economics of diabetes

P-1589

Short term economic benefits of improved glycemic control among commercially insured diabetes patients in the United States

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Background: Glycemic control, measured by HbA1c, is well known to be a valid risk marker for costly long-term complications related to diabetes, e.g. blindness, amputations etc. The relationship between HbA1c and costs in the short term, however, is not known. This study aims to investigate how HbA1c is correlated to short-term diabetes-related medical expenses.
Methods: Patients from a large commercial managed care plan database with an HbA1c reading during the second and third quarters of 2007 were identified. Diabetes-related medical care utilization was obtained from the subsequent 12-month period, ending in the third quarter of 2008. Multivariate adjustment was performed using generalized linear model (GLM) regression techniques, applying a gamma model with log link, to identify the relationship between HbA1c and diabetes related medical costs.
Results: 36,306 individual patients with an HbA1c reading ≥ 6% were identified, 1,837 with type 1 diabetes and 34,469 with type 2 diabetes. Mean patient age was 55, 46% were female, 23% were treated with insulin +/- OAD, while 60% were treated with OADs only. The remaining 17% did not use any blood glucose lowering agents. The multivariate analysis showed that several characteristics significantly correlate with diabetes-related medical costs including HbA1c for both type 1 and type 2 patients. Every 1 percentage-point increase of HbA1c will, on average, be associated with a 7.3% and 3.4% increase in short-term diabetes-related medical costs for type 1 and type 2 diabetes, respectively. In monetary terms that amounts to estimated annual costs increases of $539 for type 1 patients and $194 for type 2 patients.
Conclusion: HbA1c is correlated to diabetes-related medical costs in the short-run. This supplements conventional wisdom that HbA1c affects risk of long-term complications and long-term costs. Thus, besides the clinical incentive of improving glycemic control this study shows that there are also shorter term financial incentives for managing glycemic control among patients with diabetes.

Conflict of interest:
Employee: Novo Nordisk Inc

P-1590

Total health care expenditures associated with treatment modification in type 2 diabetes mellitus (T2DM) patients taking oral anti-diabetic drugs (OADs)

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Background: To provide an optimal benefit-risk profile, OADs must be appropriately titrated and are often used in combination.
Objectives: To compare health care expenditures among T2DM patients who 1) added a new OAD medication to initial therapy, 2) titrated initial OAD up to intermediate dose, and 3) up-titrated initial OAD beyond intermediate dose.
Methods: Insurance claims data were obtained from ~90 health plans for patients age ≥18 years with T2DM based on ≥2 ICD-9 claims during the period 1/1/2001-6/30/2007 and newly prescribed metformin or sulfonylurea monotherapy regimen lasting ≥90 days. Patients with type 1 or gestational diabetes, or OAD use within 180 days prior, were excluded. Patients were followed after initiation of monotherapy to identify occurrence of 1st treatment modification (addition or up-titration). Up-titration was divided into subgroup 1: titration to intermediate dose or below (=1500 mg for metformin, =4 mg glimepiride, =10 mg glipizide, = 7.5 mg glyburide), and subgroup 2: titration beyond intermediate dose. Study outcomes were analyzed during for the year following 1st treatment modification.
Results: Data for 22,917 patients were analyzed; 27% (n=6,191) had a new OAD added to their initial therapy, while 73% (n=16,726) had their initial

OAD up-titrated. Among patients who were up-titrated, 48% (n=8057) were in subgroup 1 and 52% (n=8669) were in subgroup 2. Mean [SD] total healthcare costs were lower for patients who added a new OAD to their initial therapy than for patients who were up-titrated ($8157 [$16,771] vs. $8447 [$20,281]; median = $4264 vs. $4764; p<0.0001]. Total healthcare costs were highest for subgroup 2 ($8684 [$22,182]; median = $4811) than for subgroup 1 ($8227 [$18,338]; median = $4624; p<0.0001). In a multivariable model adjusting for prior health care expenditure, demographic, and clinical variables, mean predicted costs for OAD addition remained significantly lower than initial OAD up-titration [$9568 vs. $10,027; p = 0.048]. In subgroup regression analyses, total costs of new OAD addition remained significantly lower than for both subgroups [$8542 addition vs. $8984 subgroup 1, p= 0.046; $10,425 addition vs. $11,174 subgroup 2, p= 0.042].

Discussion: Up-titration of initial OAD therapy was associated with higher subsequent total health care costs than addition of another OAD in this cohort of patients with T2DM. The difference in total costs was higher for patients who were up-titrated beyond intermediate dose than for those who were up-titrated up to intermediate dose. When appropriate, physicians should consider adding an OAD rather than up-titrating the current OAD, particularly beyond intermediate dose levels.

Conflict of interest:
Stock ownership: G. Krishnarajah- BMS
Employee: G. Krishnarajah - BMS
Commercially-sponsored research: R. Chapman- IMS, M. Bhosle- IMS

P-1591

Medication costs of diabetes patients in Finland in 1998-2007

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Aims: Prevalence of diabetes has grown rapidly in all countries, including Finland. Especially, number of patients with type 2 diabetes is increasing. Naturally, costs of treatments of this disease have increased, including costs of medicines. We studied use and costs of medications in diabetes patients as compared to the general population.

Methods: The CoDiF study employed individually linked data from several Finnish national health registries. Persons diagnosed for diabetes were identified from the Hospital Discharge Registry, the Health Insurance (HI) Registries on reimbursement of medication, Medical Birth Registry, and Causes of Death Registry. Utilization and costs of medication was drawn from the reimbursement of medication registry of the HI in years1998-2007. All costs are in 2007 prices.

Results: The number of diabetes patients increased from 1998 to 2007 by 59%, similarly in both types. However, at the same time, the number of purchasers of diabetes medication increased by 150%. Total costs of all medication purchases of diabetes patients increased during the ten years period on average by 7.5% annually in both patient groups, while in general population the growth rate was 3.9%.

The average costs of all medications purchased by diabetes patients were € 836 per patient in 1998; € 1080 in 2007, the average annual growth being 2.3%. Accordingly, in general population, the purchases were € 180 and € 262 per person, an annual growth of 3.8%.

Conclusion: In total, in 1998-2007, the total medication costs of diabetes patients have grown faster than in general population. On the other hand, the number of diabetes patients using medicines has grown even faster, and thus, the growth of medication costs per diabetes patient has been slower than per capita growth in general population.

No conflict of interest

P-1592

Estimation of direct medical cost of severe hypoglycaemia in type 1 and type 2 diabetes patients in Switzerland

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Objectives: To assess the treatment cost of severe hypoglycemia in diabetes mellitus type 1 (T1DM) and type 2 (T2DM) in Switzerland.

Methods: Severe hypoglycemia was defined by clinical picture as not self-treatable and needed assistance from another person. Cost of severe hypoglycemia was restricted to the subdivision of cases in which medical care was required. Default values of kind and number of drugs and services as well as of the percentage of patients receiving these resources were specified from literature and locally validated by Swiss expert opinion. Resource utilization was valued with Swiss official prices, tariffs and operational costs. Drug prices were taken from the List of Specialities, outpatient services were rated with the federal medical tariff, inpatient services were valued with all patient diagnosis related groups, and operational costs of emergency were derived from personal communication with Swiss Conference of Cantonal Ministers of Public Health.

Results: The kind of services needed for the treatment of severe hypoglycemia was identical in T1DM and T2DM. By contrast, the percentage of patients utilizing a service was different in T1DM and T2DM: Ambulance transport and emergency physician rendered first aid and admitted patients to outpatient care. Glucose/glucagon was administered in 35% and 50% of all severe hypoglycemia cases in T1DM and T2DM, respectively. After 3 hours observation in day hospital 7% of T1DM and 20% of T2DM patients required inpatient care. After recovery all patients were trained in hypoglycemia awareness during a follow-up visit. Treatment cost of severe hypoglycemia amounted to CHF 1055 in T1DM and CHF 1966 in T2DM. Major cost drivers represented emergency with 50% and 38% and inpatient care with 33% and 50% of total severe hypoglycemia costs in T1DM and T2DM, respectively.

Conclusion: Cost of severe hypoglycemia was estimated first-time in Switzerland. Cost of severe hypoglycemia was found to be substantially higher in T2DM than in T1DM reflecting the higher percentage of cases requiring emergency and particularly inpatient treatment in T2DM.

Conflict of interest:
Employee: Marie Azoulay, sanofi-aventis
Commercially-sponsored research: Roger-Axel Greiner, Consultancy Health Economics

P-1593

Treatment pattern and outcome changes for type 2 patients on basal therapy with insulin aspart add-on in a real-world managed care setting in the US

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Background: Exogenous insulin therapy will be necessary for maintaining glycemic control for many patients with type 2 diabetes, a disease characterized by progressive beta-cell failure. Insulin aspart (IAsp) is a rapid-acting insulin analog developed for mealtime use. This study is intended to illustrate the implications of IAsp add-on in a real world setting for type 2 diabetic patients (T2DM) that are presently receiving basal therapy.

Methods: T2DM patients having the same basal insulin with add-on IAsp were identified from a large commercial US health plan database between April 1, 2007 and September 30, 2008. Patients were required to have more than 90 days on treatment pre- and post-IAsp initiation. Patients with other bolus therapy were excluded. Wilcoxon signed rank test for continuous variables, McNemar's Test for categorical variables were used to test the difference of self-comparison between before and after IAsp add on.

Results: A total of 1,739 patients with an average age of 56 years, were selected; 45% were female. After IAsp add-on, the percentage of patients using any OAD decreased from 64% pre-IAsp to 56% post-IAsp (P<0.001). In particular, Metformin decreased from 40% to 35%; TZDs decreased from 23% to 14%; Sulfonylureas decreased from 25% to 14%; Exenatide use decreased from 12% to 7%. All these percentage decreases were statistically significant. HbA1c decreased by 0.45% from 8.63%, pre-index, to 8.18%, post-index (p=0.002). With good glycemic control, total annual health care expenditures were statistically significantly lower after IAsp add-on compared to the pre-IAsp period ($44,304 vs $42,021; p=0.001).

Conclusion: With IAsp add-on to T2DM patients' basal insulin regimen, fewer patients needed OADs and better glycemic control was achieved. Furthermore, patients on average experienced reduced health care utilization after IAsp add-on, which resulted in a significant cost saving for the health care payer.

Conflict of interest:
Employee: Novo Nordisk, Inc

P-1594

Economic costs associated to type 1 diabetes

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Background: Type 1 diabetes mellitus is one of the most frequently encountered metabolic diseases in chronic pediatrics diseases and is associated with elevated morbimortality, and has important repercussions for health, social, and economic viewpoints because it comprises a chronic disease with a high demand of resources.
Objective: The present study was conducted to determin economic costs associated to diabetes in a patient group with type 1 diabetes.
Methods: T1 DM family direct and indirect costs were obtained from a standardized economic survey applied to parent or tutor of children with type 1 Diabetes Mellitus with no chronic severe complications, enrolled at the Diabetes Clinic at the Instituto Nacional de Pediatría in Mexico City, during 2008-2009. The data about metabolic control for each patient were obtained through the corresponding medical profile. We investigate health-related quality-of-life in all the children.
Results: 50 children with T1 DM with no chronic severe complications were identified, 46% females and 54% males, with a diabetes duration of 30 months. Metabolic control as [glucose 141 (63-450 mg/dL), HbA1c 7.29 ± 2.9 % (2.8-14.7). Mean family annual direct cost of treatment and monitoring was US $ 2,350.87/patient/year, which contains government funding given both outpatients and inpatients. With respect to costs, the highest percentage corresponds to insulin and glucose self measurement. Indirect cost were lower than direct cost US $ 567 /patient/year.
The child´s reported quality of life is related to age and gender.
Conclusions. We conclude that economic cost associated to type 1 diabetes is important and presents a notable and independent increase with hospitalizations related to diabetes, and micro and macrovascular complications.

No conflict of interest

P-1595

Cost-effectiveness of insulin glargine versus NPH insulin for the treatment of type 1 and type 2 diabetes in Switzerland

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Objectives: To evaluate the cost-effectiveness of insulin glargine compared to NPH insulin in patients with type 1 (T1D) and type 2 (T2D) diabetes, modeling the interaction between hypoglycemia and glycemic control (HbA_{1c}).
Methods: Two validated discrete event simulation models for T1D and T2D using evidence from Diabetes Control and Complications Trial and UK Prospective Diabetes Study, respectively, were applied to predict incidence of hypoglycemia, micro- and macrovascular events, life expectancy, quality-adjusted life years (QALYs) and direct medical costs in patients on insulin glargine or NPH insulin. Both models were populated with published Swiss patient characteristics. Baseline risks and relative risk reductions of symptomatic, nocturnal and severe hypoglycemic events as well as utility decrements of micro- and macrovascular events and the hypoglycemia fear score were derived from literature. Costs of severe hypoglycemia and of micro- and macrovascular events, applied from literature or guideline-projected resource-use estimation, were valued with Swiss official prices or tariffs and were expressed in 2006 CHF. Simulations were run with 1000 patients/cohort over a time horizon of 40 years. Costs and effects were discounted at 3.5%/year. Incremental cost effectiveness ratios (ICER) were expressed as cost per QALY and per life year gained. One-way sensitivity analyses were performed.
Results: Over 40 years, insulin glargine was associated with additional life expectancy in T1D (0.059) and T2D (0.05) as well as with an improvement in QALYs of 0.238 in T1D and of 0.098 in T2D compared to NPH insulin. In T1D, savings of CHF 1,476 turned insulin glargine into the dominant strategy. In T2D, incremental costs of CHF 2,578 resulted in an ICER of CHF 51,100 per life year gained and CHF 26,271 per QALY gained. In wide-ranging sensitivity analyses the ICER was most sensitive to changes in costs, utility decrements and relative risk reductions of hypoglycemia in T2D, while in T1D the savings were most sensitive to cost of hypoglycemia and cost of long-term events. HbA_{1c} reduction, relative risk reductions of hypoglycemic events, and utility decrements of hypoglycemia and long-term events mostly affected the QALYs in T1D.
Conclusion: Modeling the interaction between hypoglycemia and glycemic control, insulin glargine versus NPH insulin proved to be dominant in T1D and was cost effective compared to accepted ICER thresholds (less than CHF 60,000/QALY) in T2D in Switzerland.

Conflict of interest:
Employee: Marie Azoulay, Sanofi-aventis
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P-1596

Cost of treating diabetes in a developing economy

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Aim: The study set out to determine the out-of-pocket and indirect costs of treating diabetes mellitus in Nigeria with a developing economy and little or no health insurance.
Method: The study was conducted at two tertiary health facilities that are 25 kilometers apart and operate under the same management, the Wesley Guild Hospital (WGH) and the Ife Hospital Unit (IHU) both in south western Nigeria. An interview-structured questionnaire and case note records were used to determine demographic variables, how much patients had expended on diabetes care, sources of funds for care, ability to cope with paying, number of clinic attendance and number of days spent on admission all in the preceding 12 months.
Results: There were 94 patients in all (M: F= 1:1), the average age was 62 years, 29 were retirees and 83% of the patients were in the low socioeconomic class. The average clinic attendance was 8/12 months while the average duration of hospital stay was 38 days. The total cost of insulin, oral hypoglycaemics, other drugs and laboratory test was $51,986.00. Only six patients had their own glucometer. With respect to the ability to cope with paying for care, 56 % of the patients reported that they cope with difficulty or great difficulty while a third had to depend on relations for diabetes care payment.
Conclusion: The out-of-pocket and indirect cost of diabetes care appeared intolerably high to these mostly indigent patients. An effective health insurance scheme might ameliorate this presently unacceptable situation.

No conflict of interest

P-1597

Long term cost-effectiveness of insulin detemir versus insulin glargine in type 2 diabetes patients: an analysis based on real life clinical data from a US managed care setting

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Aims: Long acting insulin analogs have been shown to be the preferred insulin for initiated insulin therapy at a point when glycemic control can no longer be adequately controlled without exogenous insulin. This study is a cost-effectiveness analysis comparing insulin detemir (IDet) versus insulin glargine (IGlarg) given to patients initiating insulin.
Methods: The analysis is based on results from real life clinical practice of type 2 diabetes in the US, i.e. data from General Electric EMR database (9/1/2004 to 4/30/2008). Insulin-naïve patients starting on IDet (N=308, age=58.8, male=53.6%) or IGlarg (N=6262, age=58.7, male=50.4%) were identified and analyzed. Overall, insulin analogs reduced blood glucose, HbA1c, by -1.4%-point (from 9.2%), which serves as the base case of the analysis. Controlling for covariates, IDet trended towards an additional HbA1c reduction of -0.216%-point, which was incorporated in the model analysis. A published, validated, peer-reviewed computer simulation model of diabetes (the CORE Diabetes Model) was used to project the difference in outcomes from the HbA1c difference in the analyzed population cohorts. Total direct medical costs (complications and treatment costs) were projected over patient lifetimes, and

future costs and clinical benefits discounted at 3% per annum.
Results: Base case scenario yields a life expectancy of 12.1±0.17 years and 7.75±0.11 quality-adjusted life years. Applying the added HbA1c reduction benefit of IDet, life expectancy and quality-adjusted life expectancy were projected to increase by 0.01±0.14 and 0.031±0.09 years, respectively. Improvements in quality of life are projected from delays of average time to onset of diabetes-related complications. Total lifetime costs/patient of were estimated to be $97,833±2.318 for IGlarg and $97,916±2,227 for IDet. These projected outcomes produce an estimated incremental cost-effectiveness of $2,658 per quality-adjusted life year gained.
Conclusion: Insulin initiation with long-acting insulin analogs effectively improves glycemic control of type 2 diabetes patients in real life clinical practice. In applying the therapeutic benefit of IDet, found in a real life electronic medical records database, to the CORE Diabetes Model, the projection of costs and outcomes suggest that IDet is a cost-effective treatment among previously insulin-naïve patients in a US managed care setting.

Conflict of interest:
Employee: Novo Nordisk Inc

P-1598

Rapid-acting insulin aspart reduces cardiovascular complications and costs in type 2 diabetes when compared with human insulin

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Aims: The NICE study was a five-year, open-label, randomized controlled trial that compared cardiovascular outcomes in Japanese type 2 diabetes patients intensively treated with human insulin (HI) or insulin aspart (IAsp), a rapid-acting insulin analog. The cost-effectiveness of IAsp versus HI was evaluated from the perspective of a third-party healthcare payer over a ten-year time horizon (five years based on within-trial observation and five years based on post-trial extrapolation).
Methods: Mortality and cardiovascular event rates from the trial were used to assess within-trial cost-effectiveness and make long-term projections. Cardiovascular events/interventions captured in the Microsoft Excel®-based model included: myocardial infarction, angina pectoris, percutaneous coronary intervention, coronary artery bypass grafting, transient ischemic attack and cerebral infarction. Within-trial mortality and cardiovascular event probabilities were derived from the annual rates observed during the trial period, while post-trial outcomes were calculated using the cardiovascular event and mortality rates from the trial adjusted for increasing age based on data from UKPDS and Japanese life tables. Event costs were calculated from hospital receipt data supplied by the Japanese Medical Data Center. Annual insulin costs were obtained from the trial. Other pharmacy costs (e.g. oral antidiabetic agents and concomitant medications) were assumed to be the same in both treatment arms and were not captured in the analysis. Life expectancy, quality-adjusted life expectancy, cardiovascular event rates and costs were evaluated over a ten-year time horizon. All costs were expressed in 2008 Japanese Yen (JPY) and future costs and clinical benefits were discounted at 3% annually. Sensitivity analyses were performed.
Results: Compared with HI, IAsp was dominant (life- and cost-saving) over a ten-year time horizon. IAsp was associated with an improvement in discounted life expectancy of 0.056 years (9.224 versus 9.168 years) and an improvement in quality-adjusted life expectancy of 0.085 quality-adjusted life years (QALYs) (7.481 versus 7.396 QALYs) versus HI. Patients in the IAsp arm also incurred lower costs (JPY 942,835 versus 1,233,553, difference -290,719) compared with HI. The reduction in cost resulted from the decreased incidence of cardiovascular events with IAsp. Breakdown of costs indicated that drug costs were higher with IAsp (JPY 625,360 versus 495,952), but these costs were more than offset by the reduced costs associated with cardiovascular complications over ten years of treatment.
Conclusion: In a Japanese type 2 diabetes population, prescribing rapid-acting insulin aspart significantly reduced cardiovascular complications, resulting in increased quality of life and decreased costs compared with human insulin

Conflict of interest:

Employee: Thomsen TL, Novo Nordisk A/S, Global Marketing, Virum, Denmark
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Epidemiology

P-1599

Equivalence between capillary, venous whole blood and venous plasma glucose concentrations in non diabetic individuals and type 2 diabetic patients

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The diagnosis of diabetes is based on the quantification of glucose in venous plasma, but in most limited-resource settings capillary whole blood is used as an alternative, although not recommended. WHO suggested a +11% capillary whole blood to plasma conversion factor, assuming linearity in equivalence, based on studies involving a limited range of blood glucose concentrations. Whether this applies to a wider range of glucose concentrations is questionable. To verify the equivalence between glucose concentrations measured in plasma, capillary and venous whole blood, we developed a protocol involving an insulin injection followed by graded glucose infusion to induce glucose concentrations variations from 50 to 400mg/dl. We studied 12 adult healthy volunteers in whom we collected simultaneous samples at specific capillary glucose targets (80-120mg/dl, 180-220mg/dl, 280-320mg/dl, 380-420mg/dl). In addition, we recruited 32 diabetic outpatients presenting spontaneously with capillary blood glucose at the similar desired targets, in whom we measured glucose concentration in simultaneously drawn venous and capillary blood samples. For venous whole blood and capillary measurements, we used Hemocue 201, and for plasma, we used a standard glucose oxidase method.
We found no statistical difference between capillary whole blood glucose and venous plasma glucose concentrations at all target glucose concentration levels (ANOVA F = 2.16, P=0.144 for non diabetic participants; ANOVA F =0.09, P=0.766 for the diabetic patients). No statistical difference was found comparing venous whole blood glucose to venous plasma glucose concentrations (ANOVA F =0.19, P=0.661 for non diabetic participants; ANOVA F =0.18, P=0.671 for the diabetic patients). Glucose concentrations on plasma and on whole blood were strongly correlated (r_s=0.953, p<0.01 for plasma versus capillary whole blood and r_s=0.873, p<0.01 for plasma versus venous whole blood). However, overall methods agreement analysis using Bland and Altman plots showed a bias of -7.1mg/dl (95% confidence interval -60.5 to 46.3mg/dl) with capillary whole blood glucose, and -10.5mg/dl (95% CI -69.0 to 48.1) for venous whole blood glucose. In 37% and 15% of measurements in non diabetic individuals and diabetic patients respectively, the difference between adjusted capillary whole blood versus venous plasma glucose concentrations were greater than recommended 20% limit. Fifty-three percent and 30% were greater than the 20% variation from the reference method for non diabetic individuals and diabetic patients respectively when comparing plasma to venous whole blood. These were above the acceptable 20% variation from plasma glucose measurements provided by the ISO.
In conclusion our results showed a good correlation but poor agreement between plasma and whole blood glucose concentrations. Diagnosis of diabetes using non plasma samples should therefore be extremely cautious.

No conflict of interest

P-1600

Prevalence of type 2 diabetes and related factors in the Cameroon Defence Forces

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Background: Although type 2 diabetes (T2D) is increasing in the general population in Cameroon, little is known about the prevalence of T2D and its associated risk factors in the Defence Forces.
Aim: To estimate the prevalence of T2D and its related risk factors in the Army population ≥ 21 years, in Yaounde, Cameroon, according to the new diagnostic criteria.
Methods: A cross-sectional study was carried out in Yaounde, Cameroon in November 2008, with 664 soldiers ≥21 years who filled out a lifestyle questionnaire to gather information on physical activity and lifestyle risk factors

and a food frequency questionnaire to ascertain dietary intake. Measurement of glycaemia, arterial pressure, weight, height, waist circumference, and other risk factors for T2D was assessed. The log-binary regression was used for the identification of factors associated with T2D, with the estimate of Odds ratios (ORs) and its corresponding 95% confidence intervals (CIs).
Results and discussion: Age varied from 21 and 59 years (mean age was 37.2 ± 9.6 years). The T2D prevalence was 10.4% (95%CI: 7.1% - 13.8%), and it was higher among officers (13.9%) than warrant officers (10.6%) or enlisted men (7%). After adjustment for physical activity, fibre and total energy intake, the following factors remained independently associated with T2D: family history of T2D (OR=2.22; 95% CI:1.18 - 4,19, p=0.014); rank (OR=2.92; 95% CI:1.28 - 6.62, p=0.01); body mass index (OR=3.32; 95% CI:1.60 - 6.86, p=0.002); waist circumference (OR=2.51; 95% CI: 1.39-4.51, p=0.002) and arterial pressure (OR=2.10; 95% CI:1.21-3.65, p=0.009).
The prevalence rate found in this study is approximately 20-fold higher than that found in a similar U.S Army population and 1.5-fold greater than the general population in Cameroon. The associated risk factors for T2D can be compared with those of other populations.
Conclusion: These findings suggest the need to control obesity and arterial pressure, especially among officers in order to reduce the prevalence of T2D.

No conflict of interest

P-1601

How does developing diabetes care influence observed incidence of type 2 diabetes?

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Aims: To explore the trends of newly diagnosed cases of persons with type 2 diabetes in relation to activities to develop diabetes care in Finland in 1995-2007. The population of Finland was 5 116 826 in 1995 and 5 300 484 in 2007.
Methods: The FinDM II - study uses individually linked data from several Finnish national administrative registers. All persons diagnosed with diabetes were identified from five sources: the Hospital Discharge Register (1969-2007), the Health Insurance Registers on reimbursement of antidiabetic medication (1994 – 2007) and on entitlements to elevated reimbursement of the medication (1964-2007), Medical Birth Register (1987-2007) and Register of Causes of Death (1988-2006). The linked data was used to identify newly diagnosed cases of type 2 diabetes in 1995 – 2007.
Results: In the late 1990s the Finnish Diabetes association worked actively on developing the prevention and care of diabetes. In 2000, work resulted in the launch of the Development Programme for the Prevention and Care of Diabetes (DEHKO 2000 – 2010). In 2003, the programme was further intensified by starting The Programme for the Prevention of Type 2 Diabetes and its implementation project FIN-D2D. In 2007, the Finnish Medical Society Duodecim launched Diabetes Current Care Guidelines underlining effective diagnosis and medical treatment of type 2 diabetes.
The number of new cases of type 2 diabetes has closely followed the actions to develop diabetes care. In the late 1990s the annual number of new cases of type 2 diabetes remained relatively stable varying between 15 000 and 16 000 in 1995 – 2000. Since then the number has rapidly increased. In the launching year 2003 of the prevention programme, the number of new cases exceeded 18 000 and by the year 2007 when the guidelines were published the number was nearly 29 000.
Conclusion: The observed incidence of type 2 diabetes based on register data on newly diagnosed cases has almost doubled during follow-up (1995 to 2007) in Finland. Besides the lifestyle and personal causes, the growing number of newly diagnosed persons with type 2 diabetes must be seen in context of age-class distribution of the population and health care actions. The adopted active and early screening and identification of persons with type 2 diabetes leads the expectation of decreasing trends in complications of type 2 diabetes in the future.

No conflict of interest

P-1602

How access to healthcare affects the detection of diabetes: a comparison of the border regions of the U.S. and Mexico

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Aims: The population of the 10 contiguous states of the US-Mexico Border Region is vulnerable to high risk of diabetes (DM) and limited access to health care. This study assesses the association between healthcare access and detection of DM and explores whether the relationship varies by country.
Methods: Using data from the U.S.-Mexico Border Study, a population-based cross-sectional survey, we identified 127 adult persons (18-64 years) with undetected DM, 218 persons with self-reported diagnosed DM, and 1775 persons without DM residing on the Mexico side of the border region; and 78 persons with undetected DM, 263 persons with self-reported diagnosed DM, and 1559 persons without DM residing on the U.S. side. Those who reported no DM but had fasting glucose = or > 126 mg/dL were classified as undetected, and the others were classified as having no DM. Healthcare access was measured by current healthcare insurance coverage, number of times receiving healthcare over the past year, and routine patterns of healthcare utilization. Stratifying by country of residence, we used logistic regression and predictive margins to estimate the association between undetected diabetes and each of the three healthcare access variables, controlling for age, sex, marital status, education, occupation, body mass index, and perceived health status.
Results: Among persons with DM residing on the U.S. side of the border, the multivariate adjusted percentage of undetected DM was higher among the uninsured (33.2% [SE:9.8%]) than among the insured (12.5% [3.2%]) ($p<0.05$). Among persons with DM in Mexico, the percentage of undetected DM was similar between insured (34.3% [7.6%]) and uninsured (39.2% [5.1%]) ($p=0.5$). Among persons with DM in the U.S., those who received healthcare 0 or 1-3 times over the past year were more likely to have undetected DM (41.2% [13.3%] and 23.5% [6.3%], respectively) than those who received healthcare 4+ times (9.1% [3.7%]) (all $p<0.05$). In Mexico, the percentage of persons with undetected DM did not vary among those receiving healthcare 0 or 1-3 times or 4+ times (39.2% [7.1%], 39.6% [6.5%], and 37.1% [6.7%], respectively). The percentage of undetected DM among those reporting use of urgent care for healthcare was higher than that of those reporting use of private care in both the U.S. (33.7% [12.9%] vs. 10.6% [2.7%], $p<0.05$) and Mexico (59.0% [8.9%] vs. 38.2% [6.9%], $p<0.05$).
Conclusion: On the U.S. side of the border, limited healthcare access was significantly associated with undetected DM. On the Mexico side, healthcare access was less strongly associated with undetected DM, and the percentages of undetected DM among both insured and uninsured on the Mexico side were similar to that of the uninsured on the U.S. side. Efforts to increase detection of DM are urgently needed, especially in Mexico. In the U.S., these efforts should focus on healthcare access.

No conflict of interest

P-1603

The impact of rural to urban migration on glucose- and diabetes-related risk factors: PERU MIGRANT Study

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Objectives: To describe differences in glucose- and diabetes-related risk factors amongst migrants from Ayacucho, a rural area, to Lima, an urban area, and those who did not migrate.
Methods: Cross-sectional study, three groups: 1) always lived in Ayacucho (n=289); 2) migrated from Ayacucho to Lima (n=589); and, 3) always lived in Lima (n=199). Age- and sex-adjusted standardised mean differences (SMD) for continuous variables were calculated with rural group as baseline with linear regression.
Results: Rural people had fasting glucose geometric mean (GM) of 79.9 mg/dL (95% CI 77-83) and insulin GM 2.7 μIU/mL (2.3-3.2). Migrant and urban people had greater glucose (9% (5-12) and 13% (8-17)), greater insulin (193% (135-266) and 251% (167-362)) and greater HOMA insulin resistance

(202% (156-257) and 245% (181-324)) than rural group, respectively. Diabetes (glucose ≥126 mg/dL) and impaired fasting glucose plus diabetes (IFG, fasting glucose ≥110 mg/dL) prevalences doubled from rural to migrant to urban groups: 0.5%, 2.2% and 5% for diabetes and 1.5%, 4% and 7% for IFG plus diabetes, respectively.
Compared to rural people, the size of differences observed were markedly high, with a difference of more than 1 SD unit, for insulin and insulin resistance. Glucose also had an important size of difference, of 0.5 SD for migrants and nearly 1 SD unit for urban people. HbA_{1c} was only higher in the urban group but no difference was observed in migrants.
Migrants' median age at first migration and years lived in an urban environment were 14.4 years (IQR 10-17) and 32 years (IQR 25-39), respectively. Within the migrant group, compared to those who migrated aged 12yo or less, a tendency towards increased chances of diabetes (OR 7.5 (1-58.7)) and IFG or diabetes (OR 6.6 (1.5-28.6)) was observed in those who migrated >12yo. No clear pattern was observed when classified by lifetime exposure to urban environment or number of years in urban environment.
Conclusions: The findings of this study suggest the impact of migration on glucose- and diabetes-related factors is more complex than previously described. Diabetes and IFG prevalences double from rural to migrant to urban groups. Within migrants, the impact of migration appears to differ by age at first migration but not length of exposure to urban environment.

No conflict of interest

P-1604

An open source statistical engine for the automatic production of standardized diabetes indicators within and across regions: results of the BIRO project

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Aim: The EU DG-SANCO co-funded BIRO project aims at building a shared information system through the application of two consecutive data processing steps, locally and centrally. A participating region maintains a Postgres database of resident data exported with common criteria. A statistical engine is required to deliver a standardized report for each region, including all diabetes indicators agreed by a literature review, and to derive aggregate tables that are sent to a central server to produce a global report based upon the same structure.
Methods: R software has been adopted as a development platform for the statistical engine, connected to the database through drivers publicly available. The concept of "statistical object" has been introduced to create aggregate tables from local data that can be sent over the network as encrypted comma delimited files. A taxonomy has been specified to provide details of all objects implemented. Graphical R functions and Latex have been used to produce individual centre and overall reports in .html and .pdf format, at agreed intervals of 6 months.
Results: The statistical engine has been successfully developed and tested on both MS Vista and Fedora Linux. Average hardware allowed completing all steps from a test sample of 17,0000 patients and over 90,000 episodes in about 20 minutes. Installation of the software is identical regardless of hardware, requiring R>1.8, Latex (Miktex), Java 6.0 and PostgreSQL. All software is released under the GPL license.
Conclusion: The statistical engine provides a platform for accurate benchmarking that currently does not exist at the point of health care provision. It may serve multiple users, from the EU/NGOs, to provide updated benchmarking of key indicators on a routine basis, to the local physician, to monitor the status of patients in a modern standardized procedure. The system may improve, through a shared infrastructure, the validity and completeness of information available. Users, once inducted to using the software, can apply it independently and build up indicators of higher quality and comparability, to be exchanged safeguarding privacy at the highest level of protection, as a result of the application of rigorous rules set in BIRO by the privacy impact assessment. The application of the statistical engine in regional and individual clinical units can help evaluating clinical practice more rapidly and efficiently. Adoption of open source technology may spread the adoption of the engine at no cost, making it available in deprived areas and worldwide to organizations e.g. the IDF. At the same time, it would allow refining statistical procedures, improving the capacity of current registers to translate data into action.

No conflict of interest

P-1605

Prevalence and risk factors for diabetes mellitus in a suburban population of Northeastern Nigeria

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Objectives: To determine the prevalence of diabetes mellitus (DM) and its associated risk factors in a suburban population of Northeastern Nigeria.
Methods: This was a cross-sectional study of consenting adults aged 17 years and above resident in Gwoza, a suburban community near Maiduguri, the state capital of Borno, Northeastern Nigeria. A questionnaire on sociodemography, personal and family history of DM and hypertension was administered. Height, weight, waist and hip circumference were measured and the body mass index (BMI), waist-to-hip ratio and waist-to-height ratio (WHtR) were calculated from the values obtained. Blood pressure (BP) was measured on the right arm with the subject sitting quietly after 5 minutes of rest. The average of two readings 1 minute apart was used. Casual plasma glucose (CPG) levels were determined using a glucometer (Liberty® Blood Glucose Monitoring System). DM was defined as CPG ≥ 11.1 mmol/L. Hypertension was deemed present if BP > 140/90mmHg. Two tailed students t-test was used to compare means. Pearson's correlation was used to determined the relationship between the risk factors. Multiple logistic regression analysis was employed to estimate the odds ratio (OR) of the risk factors for the development of DM. In all cases p-values < 0.05 were considered significant.
Results: A total of 1140 subjects made of 792 (69.5%) males and 348 (30.5%) females were studied. The mean age of the subjects was 42.9 (12.8) years [39.9 (12.7) among females and 44.3 (12.6) among males, $p < 0.05$]. Overall the crude prevalence of DM was 4.6%. the prevalence was 4.8% in males and 4.0% in females (M:F = 1.2: 1), being higher in males than in females, $p = 0.04$. Majority of the identified diabetics were ≥ 30 years of age, while only 3.8% were younger than 30 years of age. The risk factors for DM identified were increasing age, BMI, WC, WHR, WHtR and presence of hypertension. Family history of DM was not found to be a risk factor in this study. Of all the risk factors only BMI was found to be an independent risk factor for DM [OR = 3.29 (95% CI 1.229- 8.836), $p = 0.018$].
Conclusions: The prevalence of 4.6% found in this community is higher than previously reported in similar populations across Nigeria. The finding of increased BMI as an indepedent risk factor for DM in this study, underscores the need for concerted efforts to control the scourge of obesity through intense campaign on the importance of lifestyle modification. This will go a long way in reducing the rising trend of DM in our environment.

No conflict of interest

P-1606

Regional prevalences of diabetes mellitus and intermediate hyperglycemia in Kisantu, Bas-Congo, D.R. Congo: comparison of ADA 2003 and WHO/IDF 2006 criteria

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Aim: Prevalences of diabetes mellitus (DM) and intermediate hyperglycemia (IH) have not been evaluated previously in D.R.Congo. Data for DRC (DM 3.1%; IGT 7.4%) in the IDF Diabetes Atlas (3rd edition 2006) were extrapolated from studies in populations with a different ethnic background (Tanzania: MacLarty 1989; Aspray 2000). We have therefore evaluated regional prevalences of DM and IH in Kisantu, a semirural area in Bas-Congo province, DRC, using both ADA 2003 and WHO/IDF 2006 criteria.
Methods: The 2007 study was carried out in Congolese residents of Kisantu aged ≥ 20 years.

A representative sample (n=2025) of the population was selected. Fasting capillary glucose (FCG) was measured on day 1 using a Glucocard X-Meter. On day 2 FCG was repeated in subjects with FCG 126-199 mg/dl on day 1, and 2-h 75 g glucose was measured in those with FCG 100-125 mg/dl on day 1. WHO/IDF 2006 criteria were used for DM and IH. These results were compared with ADA 2003 criteria.

Results: Participation rate was 93% (1898/2025). Data for analysis were available in 1866 subjects (92%) (65% female; 51.5±16 years; BMI 22±5 kg/m^2). Regional prevalence of DM was 4.7% (3.2% known cases; 1.5% newly diagnosed cases). IH prevalence was 4.8% or 13.7% according to 2006 WHO/IDF or 2003 ADA criteria, respectively.

	WHO/IDF 2006		ADA 2003	
	n	%	n	%
Diabetes mellitus	88	4.7	88	4.7
Impaired Glucose Tolerance	27	1.5	41	2.2
Impaired Fasting Glucose				
100-125 mg/dl			215	11.5
110-125 mg/dl	62	3.3		
Normal	1689	90.5	1522	81.6

Age of DM subjects was higher than in non-diabetic subjects (p=0.03). BMI was elevated in both DM and IH subjects (P<0.01):

		Normal	DM	IH
Gender	M n (%)	596 (90.4)	36 (5.5)	27 (4.1)
	F n (%)	1093 (90.6)	52 (4.3)	62 (5.1)
Age (years)		51 ± 17	56 ± 15	52 ± 18
BMI (kg/m^2)		22 ± 5	23 ± 5	23 ± 5

Conclusion: DM regional prevalence of 4.7% in Kisantu, Bas-Congo, is higher than previously reported for DR.Congo (IDF Diabetes Atlas 2006). Regional IH prevalence varies widely depending on the choice of diagnostic criteria: 4.8% versus 13.7% according to 2006 WDF/IDF or 2006 ADA criteria, respectively.

No conflict of interest

P-1607

Mean values of cardiovascular risk factors in Spanish workers with impaired fasting glucose, type 1 and type 2 diabetes. ICARIA-DM study

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Background and aims: To know the mean values of cardiovascular risk factors among subjects with normal and abnormal glycemic profile [impaired fasting glucose (IFG), type 1 DM (T1DM) and type 2 DM (T2DM)] and to compare the different groups, within a nationwide Spanish working population.

Material and methods: This was a cross-sectional study of 375,607 workers, 72.3% male (M), with a mean age (SEM) of 36.87 (0.02) yr. All subjects underwent a routine medical check up from January 2007 to December 2007 at Ibermutuamur. A structured questionnaire, physical examination and standard serum biochemical analysis were performed. IFG was defined as fasting glucose levels between 100-125 mg/dl (without T1DM or T2DM diagnosis)[1]; T1DM (previous diagnosis of T1DM); T2DM (previous T2DM diagnosis, oral antidiabetic agents or insulin treatment or fasting glucose levels ≥ 126 mg/dl)[1]. Bivariated analyses were conducted comparing cardiovascular risk factors between altered glucose metabolism groups and non altered subjects.

Results: Anthropometric/biochemical parameters of subjects with normal glucose metabolism, IFG, T2DM and T1DM are presented in Table 1. The mean prevalence for T1DM, T2DM and IFG was: 0.3 % (95% CI, 0.00 - 0.62), 2.39% (95% CI, 2.07 - 2.71) and 10.39% (95% CI, 10.09 - 10.69), respectively.

	Normal population (n=326448)	IFG (n=39007)	T2D (n=8978)	T1D (n=1138)
Age (years)	35.7 ± 0.0	*43.4 ± 0.1	*50.2 ± 0.1	*38.1 ± 0.4
Weight (kg)	74.6 ± 0.0	*81.7 ± 0,1	*85.3 ± 0.2	*76.5 ± 0.4
Abd. Per (cm)	87.0 ± 0.0	*95.1 ± 0.1	*101.2 ± 0.2	*89.6 ± 0.6
SBP (mmHg)	124.6 ± 0.0	*134.6 ± 0.1	*142.2 ± 0.2	*131.0 ± 0.6
DBP (mmHg)	75.2 ± 0.0	*81.1 ± 0.1	*84.4 ± 0.1	*77.4 ± 0.4
BMI (kg/m2)	25.6 ± 0.0	*28.0 ± 0.0	*29.8 ± 0.1	*26.2 ± 0.1
Glycemia (mg/dl)	83.5 ± 0.0	*106.4 ± 0.0	*163.3 ± 0.6	*174.6 ± 2.5
Total cholesterol (mg/dl)	194.7 ± 0.1	*212.8 ± 0.2	*215.2 ± 0.5	194.2 ± 1.3
LDL- chol (mg/dl)	116.9 ± 0.1	*129.5 ± 0.2	*127.2 ± 0.4	*113.5 ± 1.0
HDL- chol /mg/dl)	58.0 ± 0.0	*57.2 ± 0.1	*53.8 ± 0.1	58.7 ± 0.5
Triglycerides (mg/dl)	103.1 ± 0.1	*138.3 ± 0.6	*189.6 ± 1.9	*118.4 ± 3.7
Uric acid (mg/dl)	4.9 ± 0.0	*5.5 ± 0.0	*5.3 ± 0.0	*4.2 ± 0.0
Creatinine (mg/dl)	1.0 ± 0.0	*1.0 ± 0.0	*1.0 ± 0.0	*1.0 ± 0.0
EGFR** (ml/min/1,73m^2)	88.9 ± 0.0	*86.7 ± 0.1	*88.1 ± 0.2	*91.20 ±0.5

Table 1. Anthropometric/biochemical parameters. Mean values ± SE. *p < 0.001 versus normal population. **Estimated Glomerular Filtration Rate (Abbreviated Modification of Diet in Renal Disease Study –MDRD-4- Equation).

Conclusion: In a nationwide Spanish working population, glycemic profile alterations coexist with a pathological pattern in other cardiovascular risk parameters. This data stress the need to promote and reinforce lifestyle intervention programs within working population.

[1] The Expert Committee on the Diagnosis and Classification of Diabetes Mellitus: Follow-up report on the diagnosis of diabetes mellitus. Diabetes Care 2003;26:3160–3167.

No conflict of interest

P-1608

Development of the Nova Scotia Diabetes Repository: A project of the Nova Scotia Diabetes Repository Advisory Committee

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Background: The Diabetes Care Program of Nova Scotia (DCPNS) maintains a comprehensive registry of clinically confirmed diabetes (DM) cases; however, only Diabetes Centre attendees are represented (about 70% of DM population in NS). The Nova Scotia Atlee Perinatal Database (NSAPD) and Nova Scotia Seniors' Pharmacare Database (NSSPD) also contain gold standard DM cases, but for a limited population. The National Diabetes Surveillance System (NDSS) derives nationally comparable DM statistics using administrative data; however, these cases are estimated not clinically confirmed. Combining data from various Programme Databases with routinely collected administrative data could greatly enhance DM case ascertainment. In Nova Scotia, all of these data sources are readily linkable, making the province an ideal sentinel surveillance site for DM in Canada.

Aims: To determine the technical and organizational requirements for combining data from disparate sources into an ongoing Nova Scotia Diabetes Repository (NSDR)

Methods: An advisory group with one or more representatives from each partner as well as expert consultants and several working groups identified organization and technical requirements for constructing a sustainable NSDR. These issues were addressed and a provisional NSDR was constructed using data from the DCPNS Registry, NSAPD, NSSPD, and NDSS. The repository was tested using 7 preapproved requests.

Results: Each partner has a specific mandate to collect personal information about the population it serves. Sharing these data across programmes required a Privacy Impact Assessment. Some ethical and jurisdictional issues were also clarified. To streamline access, a single Application for Access to Provisional NSDR Data was developed to replace several Programme-specific applications. Programme-specific case definitions were used to extract 107,643 unique DM cases from 1996/97 to 2005/06 for the provisional NSDR. Of the 81,447 cases for 2005/06, 33% were found in 1 source, 48% in 2 sources, and 19% in 3 sources. No single case appeared in all 4 sources.

Discussion: Many fully engaged partners collaborated successfully to develop the provisional NSDR. This work will in turn attract more partners, further enhancing the NSDR. A third of DM cases were contributed by a single partner, highlighting the importance of collaboration to DM surveillance. Merging disparate data sources identified several data quality issues, resulting in improved data quality for both the NSDR and the contributing partners.

No conflict of interest

P-1609

Defining the best architecture for secure data exchange of diabetes information in Europe: privacy impact assessment in the BIRO project

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Aims: The BIRO project involves the use of sensitive-medical data collected through diabetes registries, standardized, exchanged and further processed to support the routine publication of diabetes reports across Europe. Privacy impact assessment is a systematic process allowing to optimise the system based upon the study of its impact upon privacy. Aim of a specific project work package is to provide a definitive description of privacy risks, applicable privacy legislation and mitigation strategies adopted in the implementation and management of the BIRO system.
Methods: Four steps have been carried out: preliminary assessment, data flow analysis, privacy analysis and final report. Preliminary assessment was conducted by a multidisciplinary team carrying out a systematic review of the privacy literature and a general discussion on the data flow focused on alternatives identified in the first step. A Delphi consensus procedure was used to define the best alternative through the use of data flow tables, an information flow questionnaire and an overall consensus table. Privacy analysis covered any privacy issue arising in the transfer of data from the local centres to the central database. Potential privacy risks have been explicitly listed to indicate mitigation strategies to be implemented. The final report compiled all results according to a structured format.
Results: Preliminary analysis identified three candidate architectures, with differing levels of data sharing: "individual patient data, de-identified through a pseudonym"; "aggregation by group of patients, with Centre's identifiers available in de-identified form, securely encrypted"; and "Aggregation by Region". The second has been identified as best solution in terms of privacy protection, information content, scientific soundness and feasibility. Privacy analysis performed a detailed assessment of the various aspects involved in the adoption of the final BIRO architecture.
Conclusion: Privacy is a fundamental right of diabetic patients that must be carefully taken into account in the construction of information systems promoted by the IDF. According to Recital 26 of the EU Data Protection Directive and other relevant legislation, transborder data flow and data processing envisaged in BIRO is legally viable. Privacy impact assessment shows that the selected architecture flexibly affords the best privacy protection in the construction of an efficient model for the continuous production of European diabetes reports.

No conflict of interest

P-1610

Lifestyle and environmental risk factors associated with progression of diabetes in British Columbia, Canada

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Aim: The purpose of this research was to use a unique data linkage study, using both self-report and administrative data, employing the case definition of diabetes used in the Canadian National Diabetes and Chronic Disease Surveillance System (NDCSS), to study the relationship between these factors and diabetes progression.
Methods: Residents of British Columbia were classified as having diabetes according to a previously validated case definition based on physician and hospital claims from administrative health records. Degree of diabetes progression (including pre- and post-diagnosis and a hierarchy of severity that distinguished between diagnoses early in the progression of diabetes and those at a more advanced stage) was determined by accumulated evidence from administrative data of physician services, hospitalizations, and prescription usage, in terms of presence of comorbidities and duration of diabetes case definition. Self-reported data from the Canadian Community health Survey (CCHS) Cycles 2.1 and 3.1 for BC residents was linked to administrative data for consenting respondents. Logistic regression models were used to determine whether there were any significant differences between persons without diabetes and those with early, medium, or advanced stage diabetes at the time of diagnosis.
Results: A total of 1,737 persons with diabetes were identified. Of these, 343 were surveyed prior to a confirming diagnosis of diabetes. 646 were at a mild stage of disease, 746 experienced a moderate stage, and 345 experienced an advanced stage of diabetes.
Persons with advanced stage diabetes were more frequently former drinkers and smokers, ate more fruits and vegetables, were least active, reported higher levels of stress and a weaker sense of belonging, were more often exposed to second hand smoke, were more likely to be at an increased weight, more frequently perceived their health to be poor, reported an unmet health care, and experienced greater mortality in comparison to those with mild or moderate stage diabetes, as well as in comparison to persons without diabetes.
Discussion/conclusion: Results from our unique data linkage study suggest substantial differences in lifestyle and environmental factors associated with more advanced stages of diabetes, and poorer overall outcomes. In some cases it appears that respondents with advanced stage diabetes have adapted some lifestyle factors to address diabetes. However, decreased physical activity levels among those with advanced stage diabetes may contribute to increased weight. Environmental factors, such as a sense of belonging to the community, second hand smoke exposure, and perceived unmet health care needs may also contribute to progression of diabetes and complications.

No conflict of interest

P-1611

Prevalence of metabolic syndrome and acanthosis nigricans in students from 6 to 12 years who present overweight and at risk of obesity in elementary school, Hidalgo, Mexico

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Overweight and obesity are increasing among children, there the early development of chronic diseases has increased, when it appears as common

precedent of metabolic syndrome, however the overweight is linking with acanthosis nigricans. Acanthosis nigricans is a clinical sign that associated hyperinsulinemia and type 2 diabetes. Nowadays, Mexico is the number one in the statistics with obese children.

Aims: Establishing the prevalence and the association between the metabolic syndrome and acanthosis nigricans in school-children who present overweight and risk of obesity. Before we will relate it with diet, exercise and physical activity in students of the elementary school on March 18 students, Pachuca, Hidalgo.

Methods: Study observational, transversal and descriptive. They included 215 students between 6 to 12 years, we applied a survey which include clinical interview, frequency of consumption, physical exploration [weight, height, Body Mass Index (BMI), abdominal perimeter, arterial tension], and blood tests [cholesterol HDL, triglycerides and fasting glucose]. The metabolic syndrome diagnosis was performed according to the International Diabetes Federation. The presence of acanthosis nigricans was assessed in children with BMI ≥ percentile 85°, AN was located on the neck, knee, elbow, palm of the hands and sole of the feet.

Results: According to BMI 45% had normal weight, 21% overweight and 34% had risk of obesity. The prevalence of metabolic syndrome was 9%, 23% had high risk of developing it and 68% didn't present it. The prevalence of acanthosis nigricans was 35%, the neck was the most frequent area. In the analysis in the association of variables the prevalence of metabolic syndrome was linked by acanthosis nigricans specially in those that presented risk of obesity ($Xi^2 = 53.455$, $p < 0.05$), sedentary activity ($Xi^2 = 42.119$ $p < 0.05$), who does < 150 min of exercise a week ($Xi^2 = 48.473$, $p < 0.05$), hypercaloric diet ($Xi^2 = 11.833$), rich in carbohydrates ($Xi^2 = 27.725$) and fats ($Xi^2 = 37.730$ $p = 0.05$).

Discussion/conclusion: The students with overweight and risk of obesity had more predisposition of development metabolic syndrome and acanthosis nigricans, because they presented abdominal obesity which is the most significant criteria to diagnosis in the IDF definition to metabolic syndrome. While the acanthosis nigricans is a sign of alert in children who are obese, though all of these had been a consequence of unhealthy habits and sedentary activity.

No conflict of interest

P-1612

Monotonic increase in type 2 diabetes risk with lower education in women, concentrated risk increase among least educated men

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Aims: We sought to assess type 2 diabetes (T2D) risk by income and by education among Canadian men and women.

Methods: Data were obtained from the first wave of the Canadian Community Health Survey (2000/2001), a national cross-sectional population-based survey designed to collect information on the health status and health care use of Canadians. Using logistic regression (SAS version 9.1.3), we assessed (separately in men and women) for associations of T2D with educational level (less than high school, high school without post secondary, some post secondary). The highest education category (some post secondary) was the reference group. Associations were assessed separately in men and women through unadjusted models, age-adjusted models, and multivariate models models (ethnocultural group, immigrant status, urban vs. rural residence, weight status, physical inactivity, smoking status, other chronic conditions, regular physician).

Results: Among the 131,535 individuals surveyed, 87,309 fulfilled eligibility criteria (41,814 men and 45,495 women). In age-adjusted models, women with less than a high school education were more than twice as likely to have T2D (OR 2.16, 95% CI 1.85 to 2.54) while women with high school education only were 33% more likely compared to women with some post secondary education (OR 1.33, 95% CI 1.12 to 1.58). Further adjustment for other demographic and clinical variables somewhat attenuated these associations such that women with less than a high school education were 70% more likely to have T2D (OR 1.72, 95% 1.46 to 2.03) and women with high school education only were 26% more likely to have T2D compared to women with some post secondary education (OR 1.26, 95% CI 1.06 to 1.50) In age-adjusted models, men with less than a high school education were 36% more likely to have T2D compared to men with some post secondary education (OR 1.36, 95% CI 1.17 to 1.58). Further adjustment for other demographic and clinical variables slightly attenuated the risk increase observed in the least educated men to 26% (OR 1.26, 95% CI 1.08 to 1.48). There were no differences between men with high school education only and men with some post secondary education in either age-adjusted (OR 0.95, 95% CI 0.80 to 1.14) or fully adjusted models (OR 0.93, 95% CI 0.78 to 1.12).

Discussion: The least educated Canadian women and men are at highest risk for T2D. Further, we have detected a monotonic risk increase with lower levels of education in women but no such gradient in men. Higher levels of education appear to offer a sort of "inoculation" against T2D, particularly in women.

No conflict of interest

P-1613

Prevalence of type 1 diabetes in north India: a physician and chemist-based district level assessment

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Little work has been done on the prevalence of type 1 diabetes in North India. This paper reports the prevalence of type 1 diabetes in Karnal District of Haryana state, India as assessed by a hospital-based registry and by inputs from chemists and other physicians. Data of all type 1 diabetes patients attending the only endocrine OPD in the region was analysed, and screened for patients living in the district. All chemists in insulin business were contacted through wholesalers of the drug and requested about details of children purchasing insulin. Similarly all 18 paediatricians and 22 internists working at other urban centres within the district were requested for details of patients being treated by them. All names and addresses were cross checked to avoid duplication. Population data was taken from the 2001 national census.The survey revealed 79 male and 51 females with type 1 diabetes in the district. Of these 54 men and 36 women were from urban areas, while 25 men and 15 women were from a rural background.The overall prevalence of type 1 diabetes in Karnal district was 10.20/100,000 population (130/1274183), with a higher prevalence in urban areas: 26.6/100,000 (90/337842) as compared to rural areas: 4.27/100,000 (40/936341).Karnal City, with a population of 222017, showed a high prevalence of type 1 diabetes 31.9/100,000 (total 71 patients). The prevalence in men was much higher (11.56/100,000 or 79/683368) than in women (8.6/100,000 or 51/590815).Prevalence was 21.2/100,000 (3/14119) and 18.2/100,000 (2/10931) in boys and girls, aged 0 to 6 years respectively, yielding a total of 19.9/100,000 (5/25090). This work highlights the relatively high incidence of type 1 diabetes in North India, with a high male:female gender ratio, and high urban:rural gradient, using a simple, economical methodology. This methodology may be appropriate for assessing the prevalence of diabetes in many developing nations.

No conflict of interest

P-1614

Up-date on the epidemiology of childhood type 1 diabetes mellitus in Romania: ONROCAD Study Group

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Aims: Starting year 1996, Romanian National Organization for the Protection of Children and Adolescents with Diabetes (having the acronym ONROCAD) gathered, centralized and worked up data regarding epidemiology of type 1 diabetes mellitus (T1DM) in Romanian children (aged 0-14 years) and issued the National Diabetes Registry for Children, updated every year. The aim of this work was to evaluate the evolution of the incidence of childhood T1DM over the last 10 years and to reveal some characteristics according to gender and age group.

Methods: The information regarding new cases of T1DM in children was obtained from 3 sources: 1. The National Diabetes Registry for Children; 2. Medical records from Clinical Center "Cristian Serban" Buzias; 3. Medical records from the 41 regional diabetes centers. The databases from these sources were merged, in order to obtain as accurate information as possible. Demographic data were retrieved from the National Institute of Statistics.

Results: The yearly incidence of T1DM in children, according to gender and age group, for the last 10 years, is presented in the table.
Table. Incidence (no. of cases/100,000) of T1DM in Romanian children between years 1999 and 2008

Incidence	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
0-14 years	5.14	5.25	5.52	5.61	5.91	6.27	6.80	7.35	8.81	7.71
0-5 years	2.96	2.53	2.20	2.37	3.25	3.01	3.89	3.78	5.48	4.34
5-10 years	4.65	5.25	5.67	6.67	6.76	8.38	7.57	8.37	9.64	8.19
10-14 years	7.41	7.49	8.25	7.51	7.59	7.33	9.09	10.19	11.57	10.93

A constant increase in the incidence of T1DM was noted, for both genders, with a peak in year 2007. This was determined by 2 factors: 1. Increase in number of new cases of T1DM in children – 199 (year 1999), 197 (2000), 202 (2001), 195 (2002), 198 (2003), 203 (2004), 213 (2005), 228 (2006), 273 (2007) and 239 (2008); 2. Decrease of the number of inhabitants aged 0-14 years during the 10 years interval. There was no rule regarding the dominance of a gender. The highest incidence was noted in age group 10-14 years.
Conclusion: The incidence of T1DM in Romanian children had an ascending trend in the last 10 years, as a consequence of the higher number of new cases and a decrease in population in this age-group. The most affected age group is 10-14 years.

No conflict of interest

P-1615

The metabolic syndrome in Bolivian adolescents: does residence at altitude protect against the metabolic syndrome ?

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Objective: To describe the prevalence of risks factors and Metabolic Syndrome (MetS) in Bolivian adolescents, focusing on the role of altitude of residence.
Design: Nationally representative cross-sectional survey.
Subjects: Sample of 2578, age 12-18, (45% males, 55% females) adolescents from the Metabolic Syndrome in Adolescents Study.
Methods: MetS International Diabetes Federation (IDF) criterion components data and altitude of residence were evaluated by standard procedures.
Results: The overall prevalence of MetS was 7.7% (girls 8.1%, boys 7.1%) showing a gradient variation of lower prevalence at higher altitude: 11.1% <1500m vs 6.5% ≥1500m, p<0.0001. MetS was found in 47.6% of obese, in 19.8% of overweight, in 4.0% healthy weight and absent in thin adolescents. Healthy weight girls presented higher prevalence of MetS (p=.012) than healthy weight boys (5.0% vs 2.8%). Prevalence among obese boys was higher (p=.011) than in obese girls (59.7% vs 38.3%). Risk factors (1 or more) were present in 86.5% of the adolescents, rising from 75.5% at age 12 to 91.1% at age 18. The prevalent abnormality was low HDL-c level, (79.3%), followed by hypertriglyceridemia (16%), abdominal obesity (15%), high blood glucose (12.7%) and high blood pressure (5.6%). Multivariate binary logistic regression model adjusted by gender, nutritional category and altitude revealed that living at high altitude decreased the odds-ratio of hypertriglyceridemia by a factor of 0.5, while abdominal obesity increased it by 2.1, hypertension by 1.6, and hyperglycemia by 2.2 times. Overall prevalence of MetS as well as HDL-c levels showed no differences by altitude when gender and category of BMI-per age were controlled.
Discussion: Altitude can be protective against some MetS risk factors and detrimental to other, although overall prevalence is lower at high altitude. The interactions of MetS risk factors at altitude remain to be investigated to explain lower frequencies of cardiovascular mortality reported at high altitude.

No conflict of interest

P-1616

Type 2 diabetes in younger people is becoming more common in Bangladesh

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Background and Aims: Diabetes registry at Bangladesh Institute of research and rehabilitation of Endocrine and Metabolic disorders (BIRDEM), a referral center in Dhaka, has exceeded 300000 by December 2008. The registry showed an increasing proportion of younger diabetic patients. Some studies also reported that despite overwhelming malnutrition in the population, obesity in the young is on the increase. This study addressed whether there was an early onset of diabetes affecting younger people and whether obesity in the young is related to early onset.
Subjects and Methods: This retrospective study was conducted on the registered subjects at BIRDEM. It maintains the registry with relevant socio-demographic, clinical and biochemical information. From the registry, we took age, height, weight, systolic and diastolic blood pressure (SBP & DBP) including 2-samples oral glucose tolerance test (OGTT). Body mass index was calculated (BMI= weight in kg / height in m^2). We compared diabetic subjects registered in 1988 with those registered 10 years later in 1998.
Results: Overall, 18087 registered files (6263 of the year 1988 and 11824 of 1998) were retrieved. The number of registry was almost double in 10 years. In 1988, the men were 66.4% and women 33.6%. In 1998, the proportion women increased to 40%. Compared with the rural and suburb the registry from urban dwellers increased from 60% in 1988 to 65% in 1998. Regarding age distribution, 47 and 55 years were on the 50th and 75th percentile in 1988, whereas in 1998, these were 44 and 51 years, respectively, indicating an early onset. Moreover, the comparison between the two subsets (1988 v. 1998) showed that mean (SD) age was significantly lower in 1998 than in 1988 (p<0.001). In contrast, despite lower age these subjects had significantly higher BMI, higher SBP and higher post-load plasma glucose (for all, p<0.001).
Conclusions: We conclude that diabetes starts affecting younger people more than that observed 10 years back. Obesity onset was also found more in the younger age than that observed 10 years back. These findings suggest that an educational intervention or translation of the study results should be made available to the younger people at risk

No conflict of interest

P-1617

Feto-maternal outcomes in pregnancy with and without diabetes in a referral hospital: BIRDEM experience

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Background and aims: Most of the diabetes related pregnancies are referred to Bangladesh Institute of research and rehabilitation of Endocrine and Metabolic disorders (BIRDEM) for follow up and subsequent deliveries. The subjects with normal pregnancy are also referred. Although many pregnancy cases admitted for perinatal care, there are few studies on pregnancy outcomes with and without hyperglycemia. This study described the characteristics of pregnancies and outcomes at BIRDEM.
Subjects and Methods: This retrospective study was conducted on the admitted pregnancy cases in BIRDEM-inpatient for delivery. The Obstetrics and Gynecology department of BIRDEM followed up 375 diagnosed cases of gestational diabetes and conducted 1451 deliveries of various categories. We investigated obstetric history (pre-, intra- and post-natal information). We also took the history of diabetes and other systemic illnesses including complications occurred during pregnancy. Detailed history of intranatal and post-natal events was noted.
Results: A total of 1105 deliveries were investigated. Of them, 1082 had singleton and 23 were twins. The proportion of pregnancy with normo-glycemia, diabetes and gestational diabetes were 33.8, 37.6 and 28.7%, respectively. The mean (SD) age of the pregnant mothers of both hyperglycemic categories was significantly higher than the non-hyperglycemic mothers (p<0.001). There was no significant difference of gestational age between mothers with and without hyperglycemia. Intrauterine and neonatal death was found in 2.3%.

The pregnancy related complications among mothers were premature rupture of membrane (4.4%), oligohydromnia (4.4%), pregnancy induced hypertension (3.9%) and pre-eclampsia (3.1%). Of the 25 neonatal deaths according to birth-weight, 20 were found in the first quartile (less than 2.5kg), none in the second (2.5 – 2.9kg), one in the third (2.9 – 3.2kg) and 4 deaths in the fourth quartile (over 3.2kg) – indicating a "U" shaped curve.

Conclusions: The study described the types of pregnancy admitted in a referral hospital of a developing country. It revealed that despite follow up and delivery conducted in a referral hospital the mortality still remained high. Some common but important pregnancy related complications have been observed. Another interesting finding is the neonatal death according to birth-weight, which showed a "U" shaped curve – more death at the extremes of the birth-weight. More study is needed to confirm our study findings.

No conflict of interest

P-1618

Trends of diabetes prevalence in Bangladesh: a silent epidemic

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Context: Very few population-based studies conducted in Bangladesh at different times have revealed an increasing trend of diabetes prevalence in rural and urban populations. The studies conducted to observe the increased prevalence of type 2 diabetes in Bangladesh were largely based on unplanned coincidental investigations. As a consequence, these studies generally suffer from valid comparisons as they were performed at different times in different populations with varied sample sizes and applied different procedures for both blood glucose estimation and other biophysical measures.

Aims: The purpose of this study was, therefore, to observe the temporal changes in the prevalence of diabetes in both rural and urban population of Bangladesh.

Methods: This study was purely based on literature review. Authors of this study have reviewed in total of 11 full articles and 22 abstracts and related articles were reviewed to prepare this paper. The articles were reviewed from "Diabetes Medicine", "Diabetes Care", "Diabetes Research and Clinical Practice" and "PUBMED". The key word of searching the articles was "Diabetes in Bangladesh", "Diabetes + Bangladesh" and "Diabetes & Bangladesh". The articles, abstracts and related articles were reviewed chronologically by year and the starting year was 1956 and the end was at 2007.

Results: As in 1974 the total population of Bangladesh was 78,479,000 and if we calculate the percentage of diabetes patients depending on that data then the percentage of identified diabetes patients in 1974 was 0.0033%. In another study it was found that total 50,000 patients were registered with BIRDEM since its inception on 1956 till 1980's. In this manner it can be said that the number of patients rose drastically from 1970's to 1980's. In 1994 the prevalence of NIDDM in rural Bangladesh was 2.1% and IGT prevalence rate was 13.3%. The crude prevalence of NIDDM was 2.1% (men 3.1%, women 1.3%) and IGT was 13.3% (men 14.4%, women 12.4%) and age-adjusted (30-64 years of age) prevalence was 2.23% for NIDDM and 15.67% for IGT in 1995. In another study conducted in the same (1997) year followed by WHO criteria the crude prevalence of IGT was 7.5% and NIDDM was 4.1%. After that in 2006 a nationally representative study reveled that the prevalence of diabetes among urban population has become almost 21%. The presence of this disease in slum population is also very high.

No conflict of interest

P-1619

Sociodemographic, clinical and lifestyle factors associated with psychiatric illness among patients with diabetes

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Aim: The aim of this study was to determine the association of metabolic control, sociodemographic and lifestyle factors with the presence of psychiatric illness in diabetic patients after controlling for potentially confounding variables.

Methods: The study was carried out on a sample of 150 individuals with diabetes. The Patient Health Questionnaire and Aga Khan University Anxiety and Depression Scale were used for psychiatric evaluation. Sociodemographic, clinical and lifestyle data was collected from patients after taking consent. Logistic regression was used for determining the association.

Results: The age of patients was 50.48 ± 12.02 years and the duration of diabetes was 5.85 ± 5.36 years. 55% of the patients were female and 89% had type 2 diabetes. Independent factors found to be significantly associated with depression included younger age, female sex, being unmarried, being from urban locality, low income, unemployment, higher fasting and random blood sugar values, higher HbA_{1c} values, non-smoking and being physically inactive.

Conclusion: The study shows that many factors adversely affect the psychological health of diabetic patients. There should be routine screening of diabetic patients especially targeting individuals with low socioeconomic status and deteriorating glycemic control.

No conflict of interest

P-1620

Risk factors for arterial disease (RFAD) evolution at a city of the province of Córdoba - a 13 year follow up: Study Deán Funes 2

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Introduction: The internationally known RFAD: dyslipemia, obesity, diabetes, hypertension and smoking habits are growing in the western world. It is important for us to know the prevalence of RFAD, and the evolution that has had in the last years. We decided to follow up a demographic sample that had already been studied and evaluated in 1994 (Study Deán Funes 1, 20-70 years population).

Objectives:

1. To evaluate the current prevalence of the RFAD: dyslipemia, obesity, diabetes, hypertension and smoking habits in the Dean Funes population.
2. To compare the current prevalence with the ones found in 1994 (Study Deán Funes 1).

Materials and methods: 336 persons (women and men) between 33 to 83 years old, 33% men and 67% women. Anamnesis about risk factors, physical examination with anthropometric measures (weight, height, abdominal circumference), blood pressure (BP) and lab: Cholesterol, HDL, LDL, insulinemia, glycemia and triglycerides. Criteria: Diabetes diagnosis: Previous diagnosis of diabetes or fasting glycemia ≥126 mg/dl or OGTT ≥ 200 mg/dl 2 hours later. Overweight BMI ≥ 25 and < 29,9, obesity BMI ≥ 30. Hypertension: Systolic BP ≥ 140 mm hg or diastolic BP ≥ 90 mm hg. Dyslipemia: High cholesterol ≥ 200 mg/dl; high LDL ≥ 130 mg/dl and low HDL < 40 mg/dl in men and < 50 mg/dl in women, high triglycerides ≥ 150 mg/dl.

Results: The prevalence of diabetes in Deán Funes 1 was 6.9% and in Deán Funes 2 was 8.5%; The BMI increased from 27.66% to 29.09%, the waist increased from 86.9 cm to 96.9 cm; the overweight decreased from 43.1% in 1994 to 38.8% in 2007, but the cases of obesity increased from 25.1% to 38.9%. The hypercholesterolemia in men increased 49.1% to 53.6%, and in women 32.1% to 56.3%, with a global average of 209.62 mg%; the triglycerides increased from 150.34 mg% to 167.49 mg%; HDL 45.98 mg% to 59.86 mg%. The hypertension in men increased from 39.3% to 40.2%, and in women from 33.5% to 50.9%, with a global prevalence of 45.6%. The obesity among hypertensive people was 39,8% vs 17,05% non hypertensive people. The smoking habits had a favorable evolution, people that quit smoking were 37.5% of men and the 33.8% of women.

Conclusions: Even though the demographic sample is 13 years older, the increase of the prevalence of the different RFAD was very significant from 1994 to 2007, coinciding with many demographical studies such as NHANES. This prevalence increase shows us that there is a need for more prevention programs.

No conflict of interest

P-1621

Diabetes and impaired fasting glycemia in a rural population

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Aim: To determine the prevalence of type 2 diabetes and impaired fasting glycemia (IFG) in a rural population.
Methods: A cluster sampling of 254 subjects >/=20 years old in a rural community were investigated. Fasting plasma glucose, blood pressure, height, weight, and girth of waist and hip were measured. BMI and waist-to-hip ratio (WHR) were calculated. Total cholesterol, triglycerides, and HDL cholesterol were also estimated. We used the 1997 American Diabetes Association diagnostic criteria.
Results: The crude prevalence of type 2 diabetes was 4.3% and IFG was 12.4%. The age-standardized prevalence of type 2 diabetes (95% CI) was 3.8% (3.12-4.49) and IFG was 13.0% (11.76-14.16). The subjects with higher family income had significantly higher prevalence of type 2 diabetes (5.9 vs. 3.5%, P < 0.001) and IFG (15.6 vs. 10.8%, P < 0.001) than those with lower income. Employing logistic regression in different models, we found that wealthy class, family history of diabetes, reduced physical exercise, and increased age, BMI, and WHR were the important predictors of diabetes. Total cholesterol, triglycerides, and HDL cholesterol showed no association with diabetes and IFG.
Conclusions: The prevalence of diabetes and IFG in the rural population was found to be on the increase compared with the previous reports and other Asian studies. Older age, higher obesity, higher income, family history of diabetes, and reduced physical activity were proved significant risk factors for diabetes and IFG, whereas plasma lipids showed no association with diabetes and IFG.

No conflict of interest

P-1622

Impact of depression on body composition and cardiometabolic risk factors in Korean elderly women

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Depression has been associated with abdominal obesity through the accumulation of visceral fat and subsequently has been found to predict diabetes, cardiovascular disease, and cardiac mortality. Although Korea is a rapidly aging society and depression is one of the most common mental disorders in old population, the effect of depression on visceral fat accumulation and cardiometabolic risk factors in Korean elderly women has not been studied yet. This study aimed to investigate the relationship between depression and indices of body composition, including body mass index (BMI), abdominal visceral (VFA) and subcutaneous fat area (SFA), and appendicular skeletal muscle mass (ASM), and cardiometabolic risk factors in elderly Korean women. A total of 311 women aged over 60 years and without a history of diabetes mellitus, were chosen in a cross-sectional study from an ongoing, prospective, population-based study in Ansan city, South Korea. Depressive symptoms were evaluated using the 30-item Geriatric Depression Scale (GDS 30) Korean version, with a cut-off point of 16. ASM was estimated by dual energy X-ray absorptiometry and VFA and SFA were measured by single slice abdominal CT scanning. Body mass index (BMI), blood pressure, glucose, insulin, lipid profile, high sensitive CRP (hsCRP), brachial-ankle pulse wave velocity (baPWV), carotid intimal medial thickness (IMT) were measured.
About twenty percent of the participants had depression. Subjects with depression had lower BMI, waist circumference, ASM, SFA, but had higher diastolic BP than those without (mean ±SD; BMI, 25.0±3.2 vs. 23.9±2.9 kg/m^2, p=0.01; waist, 88.5±8.0 vs. 85.4±8.0 cm, p=0.007; ASM, 12.6±1.4 vs. 13.3±1.7 kg, p=0.003; SFA, 240.4±69.5 vs. 216.8±66.5 cm^2, p=0.019; diastolic BP, 74.6±7.5 vs. 77.1±9.4 mmHg in subjects without vs. with depression). The other cardiometabolic risk factors were not different according to the presence or absence of depression. After adjusting for age, BMI, glucose, hypertension, smoking, alcohol, physical activity, education and socioeconomic status, ASM was lower and diastolic BP was higher in the subjects with depression than those without (mean ±SE; ASM, 13.5±0.1 vs. 13.0±0.2 kg, p=0.039; diastolic BP, 74.5±0.5 vs. 77.6±1.0 mmHg in subjects without vs. with depression). In multiple logistic regression analysis, the prevalence of depression in the bottom tertile of ASM was about 2.7-fold higher than those with the top (odds=2.7, 95% CI 1.1-6.4) after adjusting for confounders mentioned above.
In contrast with the previous findings, depressed Korean elderly women were leaner and had less muscle mass than those without. There may be a possibility that reduced muscle mass rather than fat mass is responsible for depressive symptoms, and vice versa.

No conflict of interest

P-1623

Self reported diabetes and estimate of undiagnosed diabetes in Quebec

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Background: Diabetes is increasingly affecting people at a younger age and the prevalence of the disease continues to rise worldwide. Diagnosing people at an early stage is important to prevent or delay diabetes complications.
Method: We conducted a telephone survey of 6,500 persons selected at random from the Quebec population to assess the self reported prevalence of diabetes and estimate the prevalence of undiagnosed diabetes. Responders were encouraged to provide a blood sample consisting of depositing two drops of blood on a blotting paper prepared by the laboratory of the Centre Hospitalier de l'Université de Montréal. The blood sample was then mailed to the lab for analysis. We report the results of the first round of the survey including 750 persons randomly selected from that population.
Results: Among the 340 individuals who agreed to participate in the study, 55% were women. 42% had a family history of diabetes, 49% had a blood test done less than a year ago, 19% reported smoking at the present time and 26 (8.4%) reported having been previously diagnosed with diabetes. Among the 134 blood samples analysed, 18 tested positive for diabetes (glucose level > 7 mmol/L) and reported not having been diagnosed previously, and 36 had a glucose level > 6,1 mmol/L and also reported not having been diagnosed previously.
Conclusion: The prevalence of undiagnosed diabetes in Quebec is high and almost equal to that of diagnosed diabetes. The prevalence of pre-diabetes is also concerning. The diagnostic test we used was easy to implement and was well accepted by the population and may constitute an affordable method to screen the population for diabetes.

No conflict of interest

P-1624

Prevalence of metabolic syndrome in the city of Celaya, Mexico

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Metabolic Syndrome (MS), includes the entities which are the main cause of morbidity and mortality in many cities and countries in the world. This is why we designed the present randomized, prospective transverse trial to determine the prevalence of MS and each of its components in the urban area of an average city of central Mexico.
A total of 608 surveys were made house-visiting random-selected addresses, in order to determine the presence of the components of MS, alimentary habits, physical activity, tobacco users, weight, height, body mass index (BMI), waist circumference and blood pressure. In a random subgroup of 102 persons, glucose, total cholesterol, HDL-cholesterol, LDL-cholesterol, VLDL-cholesterol and triglycerides were quantified in a central laboratory with a fasting time of 8-12 hours.
Among our findings, the prevalence estimates of the entities of MS by themselves were: type 2 diabetes mellitus 8.8%, of those, 11.1% newly diagnosed, fasting glucose intolerance 29.4%, overweight 40%, obesity 24.1%, hypercholesterolemia 34.3%, hypertriglyceridemia 45.0%, low HDL-c 42% and 53% in men and women respectively, and elevated blood pressure

31%. The prevalence of MS by International Diabetes Federation (IDF) criteria was 48.5%, and by Adult Treatment Panel III (ATP-III) 41.5%. Dividing men and women into 2 groups each, from 18 to 40 and 41 to 60 years of age, we observed that men tend to present MS earlier, having 50% of the cases in the first group. Women, in contrast, develop MS more avidly after 40 years of age.
Analyzing BMI and its correlation with MS, we found that people with lower risk of MS are those with BMI < 24 and < 26 in men and women respectively. Waist circumference < 89 cm is also associated with a lower risk for MS in both men and women.
Thus, we are able to conclude that Metabolic Syndrome and each one of its entities have an elevated prevalence, especially in the group of age < 40, reaching up to 50% in men.
The clinical elements that confer a greater risk for MS are BMI ≥ 24 and ≥ 26 in men and women respectively, and waist circumference ≥ 89 cm in people over 18 years of age. Half of the inhabitants 18 years or older, have MS because of the increasing prevalence of each one of the elements of MS, especially overweight and obesity.

No conflict of interest

P-1625

Characteristics and prevalence of metabolic syndrome among three ethnic groups in Cameroon

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Aims: To compare the characteristics and prevalence of the metabolic syndrome (MetS) in three Cameroonian population: Beti, Bamiléké, Sawa.
Methods: The study was based on four cross-sectional studies conducted between 2006 and 2008. Among the participants received during the study, originate from three ethnic groups living in the urban city of Yaounde were selected and underwent anthropometric measurement and biochemical test. The MetS was identified among participants according to the National Cholesterol Education Program (NCEP) definition.
Results: The age-standardized prevalence of the MetS varied by ethnic group, ranging from as high as 16.8 % among Bamiléké women to as low as 2.7% among Beti men. Compared with MetS components overall prevalence in Cameroon, Sawa had a worse metabolic profile, while Bamiléké had a better metabolic profile except for a high rate of abdominal obesity.
Conclusions: The results indicate that the MetS is prevalent in diverse ethnic groups in Cameroon but varies in the pattern of phenotypic expression. Preventives measurements must take into account these ethnics variations for the efficient reduction of metabolic syndrome frequency in Cameroonian population.

No conflict of interest

P-1626

Quality of care in patients with type 1 diabetes in a French area

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Studies describing the quality of care of type 1 diabetic patients in a population-based setting are scarce. This work aims to describe, on a specific French health area, the care of patients with type 1 diabetes selected from the French medical insurance system (covering 75% of the population).
Methods: The selection of patients was done from diabetic patients who were reimbursed from at least one delivery of insulin during the first 2007 trimester. Were first considered as having a type 1 diabetes, those with a diagnosis of diabetes before the age of 45 years and an early definitive treatment with insulin less than 2 years after diagnosis. This list has been refined by local diabetologists and then by the administration of a questionnaire by telephone or mail to patients or physicians. Biological data were collected from laboratories. All medical reimbursements and hospital data were extracted for 2 years.
Results: At last, 227 patients with type 1 diabetes were selected including 174 with questionnaires. Sex: 57% male, mean age: 40 yrs (9% <18 yrs), mean diabetes duration: 21 yrs. Based on patient reports, obesity was seen in 13%, and overweight in 24%; 21% smoked. After optimisation based on the different sources, the highest range value was 69% for ≥ 3 HbA1c tests/yr, 79% for = 1 creatininemia/yr, 77% for = 1 urine albumin/yr. During the previous 2 yrs, at least 30% did not see any ophthalmologist and 18% any diabetologist (24% based on patient reports). 26% reported having a retinopathy and 17% had an ophthalmologic laser treatment. Based on laboratory reports, 12% had a creatinine clearance < 60ml/min and 21% had micro or macro-albuminuria; 2.4% were on dialysis or with a kidney transplant; 1.1% had a major lower limb amputation. HbA1c was < 7.5% in 30% and >9% in 25%. A basal-bolus "state of the art" treatment with human analog insulin was used by 74% with 21% with an insulin pump.
Conclusion: This study evaluating the quality of care in a representative and specific population of French type 1 diabetic patients highlights that severe microangiopathic complications are frequent and that about one quarter of these patients do not receive adequate care in terms of recommended monitoring, metabolic status and insulin treatment.

Conflict of interest:

Paid lecturing: Penfornis for Sanofi-Aventis, Novartis, MSD
Advisory board: Penfornis: Sanofi-Aventis, Novartis, Novo-Nordisk, Astra-Zeneca, BMS

P-1627

Relation between nutritional risk and metabolic syndrome in the elderly

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Aims: Nutrition is regarded as a major factor in the development of metabolic syndrome. Undernutrition or nutritional imbalance, rather than overnutrition, can be associated with metabolic syndrome. We evaluated the relationship between nutritional risk and metabolic syndrome in the elderly.
Methods: We analyzed 2,284 Koreans aged over 60 years (689 men and 1,595 women, mean age 72.0 ± 6.7 years) from baseline data of a large prospective study called the Gwangju Dementia and Mild Cognitive Impairment Study (GDEMCIS). Metabolic syndrome was determined according to the National Cholesterol Education Program Adult Treatment Panel-III, and nutritional risk was evaluated using the Nutrition Screening Initiative (NSI) checklist.
Results: Among 2,284 subjects, 1,219 (53.4%) had metabolic syndrome. NSI score was higher in subjects with metabolic syndrome than in those without metabolic syndrome (2.46±1.89 vs. 2.18±1.87, $p<0.05$). The risks of abdominal obesity, elevated blood pressure, elevated glucose, and metabolic syndrome were higher in subjects with moderate or high nutritional risk compared to subjects in a good nutritional state. Nutritional risk was independently associated with metabolic syndrome for subjects in their 60s, but not in their 70s or 80s and above.
Conclusion: High nutritional risk is associated with increased risk of metabolic syndrome in the elderly. Measurement of nutritional status in the elderly may serve as a marker for metabolic syndrome, and the identification and adjustment of nutritional risk can be beneficial for the prevention of metabolic syndrome, especially for the younger elderly.

No conflict of interest

P-1628

Evolution of the metabolic syndrome (MS) at a city of the province of Córdoba, Argentine - a 13 year follow up: study Deán Funes 2

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Introduction: It has been proved that the Metabolic Syndrome (MS), high risk entity for cardiovascular disease, is widely prevalent in populations of the Western world, and has been related to cardiovascular disease and also with global mortality rate in several population groups. It is known that its

prevalence is increasing together with an increasing obesity and a sedentary life style.

Objectives:

1. To evaluate the current prevalence condition of the MS in a population and its comparison to the same population in 1994.
2. Prevalence condition of MS in the mortality of this population.

Materials and methods: 336 persons (women and men) between 33 and 83 years old, 33% men and 67% women. Physical examination with anthropometric measures (weight, height, abdominal circumference), blood pressure, blood tests: total cholesterol, HDL, LDL, insulinemia, glycemia and triglycerides.

The criteria for the MS was according to ATP III and IDF with Asian- American waist.

Results: According to the criteria of the ATP III, the metabolic syndrome increased from 23.6% in 1994 to 33.3% in 2007 and according to the criteria of the IDF from a 36.9% to 45.8%.

From the total deaths (64) between 1994 and 2007, 36.9% had MS according to ATPIII and 53.2% according to IDF.

Conclusions: as we expected and in accordance with other Latin American studies, the prevalence condition of MS has increased during the last few years, being clearly higher than in the general population. It was involved in more than half of the deaths according to IDF criteria.

No conflict of interest

P-1629

Gender and age related differences in body composition and prevalence of obesity in a semi urban Asian-Indian population

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Background: Growing urbanization, reduced physical activity and an increase in fat-laden foods are responsible for an explosive growth in life style diseases in formerly lean Asians. However by conventional standards (BMI) Asians who are apparently lean are still prone to the ill effects of obesity. Although WHO has lowered the definition of overweight for Asians, prevalence of obesity is still greatly underestimated.

Aim: To ascertain gender & age differences in prevalence of obesity measured by different parameters.

Methods: 525 randomly selected subjects were enrolled & evaluated for anthropometric measurements: Waist circumference (WC), Body Mass Index (BMI) & body composition including Body Fat Percentage (BFP). Prevalence of obesity was studied using above parameters. The subjects were stratified as obese on the basis of BFP (men ≥ 25 Body fat % & women ≥ 30 Body fat %); BMI (≥ 25)*; WC [men ≥ 90 & women ≥ 80]*. The body composition was determined by BIA (Bioelectric Impedance Analysis)-Inbody230. The prevalence of obesity was compared across various age groups in both the sexes.

. *Asia pacific guidelines

Results: · n = 525

- Men: Women = 250:275
- Prevalence of obesity:

Parameter studied	Total population n=525 (%)	Male n=250 (%)	Female n=275 (%)
BFP	334 (63.6%)	123 (49.2%)	211 (76.7%)
WC	239 (45.5%)	89 (35.6%)	150 (54.5%)
BMI	215 (41%)	91 (36.4%)	124 (45.1%)

- 91/525 (17.33%) of the population was found to be overweight (BMI = 23 -24.9)
- Age wise mean BMI in females was 21.1±4.1 (< 30 yrs); 24.1±4.5 (30-49 yrs); 26.0±3.9 (> 50 yrs). There is a clinically significant rise in mean BMI, both from young (<30 yrs) to middle age (30 to 49 yrs)[p=0.003] & from middle age to old (> 50 yrs) [p=0.034] individuals.
- Age wise mean BMI in males was 21.5±3.8 (< 30 yrs); 24.7± 3.8 (30-49 yrs); 24.6±4.0 (> 50 yrs).However there is no significant change in the mean BMI from the middle aged men to the older group. [p=0.820]
- Age wise mean BFP in females was 31.1±8.9 (< 30 yrs); 37.6±13.5 (30 to 49 yrs); 39.7±8.7 (> 50 yrs). There is a clinically significant rise in mean BFP from young (<30 yrs) to middle age (30 to 49 yrs) [p=0.008]
- Age wise mean BFP in males was 19.8±8.1 (< 30 yrs); 25.4±7.7 (30 to 49 yrs); 26.5±9.4 (> 50 yrs). There is a clinically significant rise in mean BFP from young (<30 yrs) to middle age (30 to 49 yrs) [p=0.006] However there is no significant rise in the mean BFP from the middle aged men to the older group. [p=0.43]

Conclusion:

- Prevalence of obesity is highest when BFP is used as a measure of obesity followed by WC and then BMI. This suggests a far greater role for measuring BFP routinely alongside WC & BMI.
- There is a drastic increase in the prevalence of obesity (BMI) among females as they grow older reflecting their sedentary life style.
- In our population only 41.66% were of normal weight (BMI). More prevalence of obesity is seen in females.

No conflict of interest

P-1630

Age of onset of type 2 diabetes mellitus in Nigerians: is it decreasing?

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Background/Objective: The prevalence of diabetes mellitus is increasing worldwide. The age of onset of type 2 diabetes mellitus is reportedly decreasing. We investigated the age of onset of type2 diabetes in a Nigerian population.

Patients and Methods: Hospital records of patients with diabetes mellitus seen between July 2006 and July 2008 at the Diabetes Clinic of Faith Medical Centre, Benin City were retrieved. Data extracted included the age of the patients, the year of diagnosis of DM, parity of female patients, family history of DM, presence of hypertension, height and weight for body mass index, waist and hip circumferences for waist:hip ratio. The data was analyzed with SPSS. Significant level was set at $p < 0.05$.

Result: Two hundred and ninety six (110 males, 182 females) patients with diabetes mellitus were reviewed. The mean age of onset of DM was 52 ± 11.1 years (52.4 ± 10.2 vs 51.3 ± 12.5, p = 0.015, for females and males respectively).

Females were more obese than males (BMI 29.2 ± 5.3 vs 26.7 ± 4.3 p = 0.108).Obesity and overweight were present in 31.8% and 35.5% of the patients respectively. There was hypertension in 34.8% of them. Hypertension was commoner in females. Family history of diabetes mellitus in first degree relatives was documented in 22.3% of the patients.

More females had early onset type 2 diabetes (onset before the age of 50 years) than the males (23.6% vs 16.9%) and late onset DM (37.8% vs 19.2%). Parity, presence of hypertension, a family history of diabetes mellitus in a first degree relative, did not significantly affect the age of onset of diabetes mellitus among Nigerians. The mean age of onset of DM for each year over the last 10 years ranged from 47.7 ± 9.7 to 59.7 ±13.8 years.

Conclusion: The age of onset of type 2 diabetes mellitus in Nigerians appears to have remained relatively constant despite the increases in the number of patients presenting for treatment.

No conflict of interest

P-1631

Location of diabetes 'hotspots' in Melbourne: prevalence in multicultural groups

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Background: Diabetes is one of the most concerning health issues worldwide, and in Australia it will be the leading contributor to the overall burden of disease within the next 20 years. The risk of developing type 2 diabetes is suggested to be two to three times higher for certain culturally and linguistically diverse (CALD) populations than the Australian born on average. However, the actual prevalence rates for specific CALD populations are lacking or not readily available. Victoria is one of the most multicultural states in Australia, with

Melbourne being the fastest growing capital city. Since 44% of the Victorian population is born overseas or have at least one parent who was born overseas (over 200 different countries), a review of current demographic data for CALD populations' location and diabetes prevalence in Melbourne, is needed to better target population health resources for these high risk communities.

Aim: To collate demographic data and type 2 diabetes prevalence data for culturally and linguistically diverse populations in Melbourne.

Methods: Information on diabetes prevalence and demographic data for CALD populations living within the local government areas (LGAs) was investigated from a variety of government documents/databases and the published literature.

Results: Demographic data from the Australian Bureau of Statistics 2006 Census identified the LGAs of Melbourne that contained high numbers of CALD populations (as categorised by country of birth). Specific data on prevalence rates for type 2 diabetes by country of birth has not been recorded to date.

Discussion: In order to reduce health disparities for CALD populations, the identification and location of these at risk communities has been acquired. The findings outline specific areas within the LGA where high proportions of CALD populations reside. This study highlighted the lack of data directly linking diabetes prevalence with location of specific CALD populations in Melbourne. The methodology used in local, state and national health surveys should be revised to include prevalence of diabetes for CALD populations. A possible mechanism for displaying this data collection could be through the use of geographical information system (GIS) spatial mapping tools to identify areas of high prevalence for diabetes and high CALD population densities, also known as diabetes 'hotspots'.

Conclusion: To better target diabetes prevention and management resources for CALD populations in Melbourne, data collection regarding their location and prevalence need to be improved and utilised more efficiently. Accurate identification could assist in reducing health disparities for these communities at high risk for diabetes.

No conflict of interest

P-1632

Waist circumference measurement and its correlation with bioelectrical impedance parameters in the metabolic syndrome prevalence study in Maracaibo Municipality, Venezuela.

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Introduction: Waist Circumference (WC) above the normal values is an essential criterion for Metabolic Syndrome diagnosis according to IDF and ATPIII definitions, and widely recognized to increase cardiovascular diseases incidence. The aim of our research was to determine reference values for WC in our population and to relate them with body composition parameters.

Materials and methods: A descriptive and transversal study was carried out in 979 healthy adult individuals randomly chosen (533 women and 446 men), for whom a complete clinical history was made. Body composition parameters were measured by using TANITA Body Composition Analyzer Model TBF300A. WC was measured having as reference a medium spot between anterior and superior iliac eminence and the last rib. Statistical analysis was made through the program SPSSver.15 for Windows. Results are expressed as median, percentiles were used to establish normal ranges and correlations were made by means the Pearson coefficient.

Results: WC values had a positive lineal correlation with the weight, basal metabolism, fatty mass and percentage of body fat, a non lineal correlation with lean mass and total water was seen ($p < 0,05$). Fatty mass percentiles for women and men were: p10: 5kg and 7kg, p25: 9kg and 12kg, p50: 18kg and 19kg, p75: 29kg and 28kg, and p90: 38kg and 38kg, respectively. WC percentiles were: p10: 73cm and 79cm, percentile p25: 80cm and 89cm, p50: 89cm and 100cm, p75: 99cm and 100cm and p90: 108cm and 120cm, for men and women respectively.

Conclusions: These results expose normality ranges adapted to our population, which is genetically and environmentally different. Significant correlations were found among WC and bioelectrical impedance measurements demonstrating the utility of the WC to sharply predict higher risk for acute coronary events and endocrine-metabolic disorders.

No conflict of interest

P-1633

Association of overweight and obesity with diabetes: Differential impact of adiposity between women and men according to rural or urban setting

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Background: It is well-known that a strong association exists between obesity and diabetes in both sexes; however, scarce data are available about this relationship in rural populations.

Material and Methods: IDEA (International Day for the Evaluation of Abdominal Obesity) was an international cross–sectional study that recruited 168,159 consecutive patients aged 18 to 80 years who attended the offices of randomly chosen primary care physicians on two pre-specified half days in 2005. IDEA included consecutive patients from rural and urban general practitioners in all geographic areas of all 63 participating countries, giving a representative sample of the patients attending primary care consultations. The present analysis compares the association of overweight and obesity with prevalent diabetes in rural and urban women and men in the 2965 patients (rural 1469, urban 1496) included in the IDEA study in Argentina.

Results: Rural and urban populations were similar in age and proportion of males (mean age 53.6 ± 16.0 years vs 53.9 ± 16.7 years; male sex 37.1% and 37.0%, respectively; p=ns). Prevalences of obesity and overweight were higher in rural than in urban women (28.5% and 36.3% vs 26.2% and 32.1%, p=0.017) but not different in rural and urban men (33.2% and 44.0% vs 30.4% and 45.8%, p=ns). Prevalences of diabetes were similar in rural versus urban women (8.1% vs 8.6%, p=ns) and in rural versus urban men (11.4% vs 11.2%, p=ns). In women, there was a strong, graded association between overweight-obesity and diabetes: OR (CI 95%) of obesity versus BMI < 25 kg/m² in rural women 14.0 (4.9-54.6), in urban women 4.7 (2.4-9.7); in rural men no association was found (OR: 1.5, CI 95% 0.7-3.4) but in urban men there was a moderate association (OR 3.1, CI 95% 1.3-8.1).

Conclusions: There was a differential cross-sectional association of overweight-obesity and diabetes according to gender and setting. In women, this association was stronger than in men and more apparent in rural women (albeit not statistically different from urban women); in contrast, no association was found in rural men. This data suggests that additional efforts should be directed to effectively reduce overweight and obesity, particularly in women (both urban and rural) if diabetes is to be prevented.

Conflict of interest:
Employee: Paula Hernandez Morán

P-1634

Prevalence of diabetes among the subjects diagnosed with hypothyroidism: experience from a Thyroid Clinic in a specialized hospital in Bangladesh

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Aims: Type 2 diabetes is a major public health problem affecting approximately 4.8 percent of the Bangladeshi (BD) population, with probably more than an equal number of cases being undiagnosed. On the other hand, symptoms of thyroid disease may be nonspecific or attributed to other diseases, which makes diagnosis more difficult. Incidence rates of autoimmune hypothyroidism varied between 2/100000/year to 498/100000/year. Thyroid disease had a higher incidence in women. The prevalence of diabetes in hypothyroidism is not well studied. Literature showed association of autoimmune thyroid diseases with type 1 diabetes. So, the study was designed to see the prevalence of type 2 diabetes in hypothyroid patients of any etiology.

Methods: All diagnosed hypothyroid subjects (subclinical or overt) reported in one year (July 2007- June 2008), not known to be diabetic previously, underwent standard OGTT (FPG and 2-hour post 75 gram glucose) before initiation of thyroid hormone replacement. The diagnosis of glucose intolerance was done according to W.H.O. criteria of 1997.

Results: 442 subjects with hypothyroidism were studied. (N=442).Mean age ranging 31.7±3.5 years. Male144 (30.69 %) and Female 298 (69.31 %). BMI 23.3 ± 2.3 kg/m. Among the study subjects 56 (12.66%) has Impaired Glucose Tolerance (IGT). Thirtyone subjects was detected as diabetic 31/442 (7.01%). Total glucose intolerance was detected 87/442 (19.68 %). All of

these according to W.H.O. criteria adopted in 1997. The prevalence of diabetes in Bangladesh is 4.8% [8] and IGT 8.6 % according to study in 2006[8]. Newly detected diabetes among the subjects diagnosed with hypothyroidism is significantly higher 4.8 % vs. 7.01 % ($p<0.01$) and the prevalence of pre-diabetic state Impaired Glucose Tolerance (IGT) is also higher (11% vs. 12.6 %). Pure IFG (FPG ≥ 6.1 mmol/l but <7.0 mmol/l, and 2-PG < 7.8 mmol/l) was found in 5.2 % according to WHO criteria and the prevalence is higher (6.8%) with ADA criteria (considering normal FBG <5.6mmol/l).

Conclusion: In this study, the prevalence of diabetes (particularly type 2 diabetes) is found higher among the hypothyroid subjects. The prevalence of pre-diabetic state, Impaired Glucose Tolerance (IGT) is also found higher than the epidemiological data of the country Bangladesh published in 2006. The present study indicates that all patients presenting with hypothyroidism should be screened for diabetes also. As in this study, sample size is small, further study with larger population as RCT (Randomized Control Trial) also needed to explore and to confirm the results. Another possibility is that, the prevalence of diabetes in the country is rapidly increasing; measures should be taken urgently to prevent the rapid progression of the disease (Type 2 diabetes).

No conflict of interest

P-1635

Prevalence of vitamin D deficiency and associated factors in Taiwan

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Aims: Vitamin D deficiency (VDD) is common in elderly people in northwestern European countries, especially in institutionalized people. VDD is particularly prevalent in patients with hip fractures, and a causal relationship between osteomalacia and hip fractures had been demonstrated. The aim of this study was to determine the prevalence of VDD in the people who were aged over 30 years living in Tainan city, and also to investigate possible risk factors associated with VDD.

Methods: A total of 2412 subjects were eligible and 1596 subjects (66.2%) participated in the study (1034 men; 562 women). The dietary calcium and vitamin D intake was estimated by using a food frequency questionnaire. In all subjects, a fasting blood sample was drawn for measuring by radioimmunoassay and VDD was defined as serum 25 (OH) vitamin D level <20 ng/mL.

Results: The prevalence of VDD was 9.9% (10.0% men and 9.9% women). Elderly subjects had higher levels of systolic blood pressure, fasting plasma glucose, HbA1c, total cholesterol and triglyceride but lower vitamin 25 (OH) D level and smoking habit than younger subjects. Elderly subjects also had a higher prevalence of VDD than younger subjects. The significant factors associated with VDD were old age and alcoholic drinking habit in women. However, there were no significant associated factors with VDD in men.

Discussion/conclusions: The prevalence of VDD was 9.9% and elderly subjects had a higher prevalence of VDD than younger subjects. The significant factors associated with VDD were old age and alcoholic drinking habit in women, but not in men.

No conflict of interest

P-1636

Acute hyperglycaemia in patients with thyroid orbitopathy treated with steroid pulses – based on own materials

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The aim of the work was to estimate the prevalence of acute hyperglycaemia during systemic steroid therapy in patients with thyroid orbitopathy in the course of Graves-Basedov's disease during euthyreosis with previously non-recognised carbohydrate metabolism disorders (pre-diabetic condition, diabetes) and normally functioning kidneys and liver.

Material and Methods: The study comprised 35 patients, 25 women and 10 men aged 52.74 +/-7.8 yrs. In all patients without previously recognised diabetes prior to steroid therapy, oral glucose tolerance tests were carried out and HbA1c, transaminase activity and creatinine level were determined. During steroid therapy (average Sol-Medrol dose 6+/-2 g) an 8-point daily glycaemic profile was run.

Results: Based on oral glucose tolerance test (OGTT) carbohydrate metabolism disorders were recognised in 15 patients (diabetes in 2, IGF in 8 and IGT in 5). All patients during steroid therapy had postprandial hyperglycaemia (140 to 330 mg/dl). Patients with hyperglycaemia over 140mg% were administered insulin therapy in the form of short-acting insulin boluses before each main meal in the daily dose 8+/-2 units (22 patients) or metformin (4 patients). In these patients after steroid therapy completion glycaemic level lowered to 120+-5 mg%. Following steroid therapy in 7 patients with continuing glycaemia (diabetes recognition criteria with HbA1c 5.74 +/-0.48) hypoglycaemic treatment was carried on.

Conclusions:

1. Before deciding on systemic steroid therapy patients with thyroid orbitopathy should be given oral glucose tolerance tests.
2. A daily glycaemic profile should be run during therapy with steroid pulses.
3. Acute hyperglycaemia occurring during systemic steroid therapy should be treated with boluses of short-acting insulin /or analogues before each main meal.
4. In patients meeting diabetes recognition criteria (acc. to WHO) both after completing and during continuations of oral steroid therapy there should be applied hypoglycaemic treatment like in diabetes type 2.

No conflict of interest

P-1637

Prevalence of diabetes mellitus in a town of the Argentine Mesopotamia (Gobernador Virasoro, Corrientes, Argentina)

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Background and aims: Our aim was to estimate the prevalence of Diabetes Mellitus (DM) in a town of the interior of the Corrientes province, Argentina and to evaluate (later on) the association of diabetes with independent covariates such as obesity, hypertension and dyslipidemia.

Methods: Out of a population of 26.018 inhabitants, almost entirely Caucasians, we selected a representative sample of 657 individuals with a multietapic probabilistic aleatoric procedure and with a precision of 4 %.

The demographic and clinical data was registered in a validated questionnaire. We used colorimetric enzymatic procedures for the biological variables and we applied the WHO and the JNC 7 diagnostic criteria for diabetes and obesity, hypertension and dyslipidemia respectively.

The confidence interval was calculated by the exact binomial method and the rates were standardized by age. The association between DM and several covariates was studied both by univariate (Chi 2, t test, Mann-Whitney) and multivariate (multiple logistic regression) techniques.

Results: The sample included 657 individuals, (52.6 % women) between 20 and 79 years of age with a mean of 56.5 +/- 12.3 years. There were 31.37 % of unknown cases of diabetes.

The crude prevalence rate for DM was 7.76 % (95 % CI 5.64 - 9.89 %), for obesity 26.00 %, for hypertension 44.59 % and for dyslipidemia 27.85 %.

The adjusted rate by age for each pathology and sex was:

- Men Women
- DM % (95% CI) 7.48 (4.42 - 10.54) 7.93 (4.99 - 10.87)
- Obesity % (95% CI) 23.69 (18.22 - 29.17) 28.00 (22.43 - 33.58)
- Hypertension % (95% CI) 50.13 (42.16 - 58.10) 39.75 (33.09 - 46.40)
- Dyslipidemia % (95% CI) 29.45 (23.39 - 35.50) 26.45 (21.04 - 31.86)

In the univariate analysis there was a significant statistical association ($p <.001$) of DM and age, BMI, SBP, DBP, total cholesterol and triglyceridemia. In the multivariate analysis, DM adjusted by BP and cholesterol was significantly associated with age (p .00001), triglyceridemia (p .0001) and log BMI (p .0161)

Conclusion: The prevalence of DM in Gdor. Virasoro was 7.76 %, in concordance with others studies in the country. Its presence was significantly associated with age, BMI and triglyceridemia.

No conflict of interest

P-1638

Registry of people with diabetes with young age at the onset

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The Task Force Project entitled," Registry of People with Diabetes in India with Young Age at the Onset," was started with the aim to understand (i) the magnitude of problem; (ii) disease pattern or types including the geographic variation and (iii) incidence and prevalence rate of complications. All the cases of diabetes reported after January 1st, 2000 with the age equal to or less than 25 years age with fasting plasma glucose >126 mg/dl and/or 2 hr post load plasma glucose >200mg/dl, referred/non-referred, treated/untreated residing within the assigned geographical area are included. The cases on steroids and those having short term increase in blood sugar are excluded. The tertiary hospital based registry is set up with the recruitment of all subjects in the age group equal to or less than 25 years. One Collaborating center each in the north, south, east, west and northeast regions of the country are included. Each centre has obtained information from the interacting diabetes centers/ clinics. The core or broad proforma is being followed by all the centers during the data entry. The proforma includes the demographic and clinical information of the subjects along with the family history. The data entry is done with the help of manually filled in proforma. The centres having facilities are encouraged to use the screen-based proformas provided by the Coordinating Unit. In these centers, the data entry would follow a web-based approach but the hard copies of proforma would also be kept for the record. At Northern Indian; 75.7% subjects were Type 1 diabetes and 24.3% were Type 2 diabetes. The prevalence and complications of the reported case were as follows: Neuropathy: 4.17%; Retinopathy: 6.94%; Nephropathy: 4.17%; CAD: 1.4%; Tuberculosis: 6.94%. At Southern India, 44.2% were reported with Type 1 Diabetes, while type 2 is 25.6% and MODY is 19.2%. At Eastern India, 94% subjects were presented with Type 1 Dabetes Mellitus. At a North Eastern centre of country, 20% are reported with Retinopathy and 10% with Nephropathy. The workshops are conducted by each Collaborating Centre for interaction with other Reporting Centres. (which are usuall more than 50 centres per region) for data entry and filling up of the proforma. The study is into its third year and blood samples are being stored for future molecular and genetic analysis and shall help in creating the Biobank.

No conflict of interest

P-1639

Redetermination of diabetes, impaired glucose tolerance and related factors among Turkish Cypriot Community

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The aim of this study is to determine the prevalence of diabetes and IGT among Turkish Cypriot people.

The study group was chosen among adults between 20-80 years by random sampling method, taking their age, gender and place of residence into consideration. 1,780 people were invited to take part in the study. Between 24-28 November 2008 the participants were invited to 21 health centres according to a schedule and a questionnaire form was filled in order to obtain personal information, family history and lifestyle. Following this, anthropometric measurements were taken and an OGTT was performed.

Diagnosis of diabetes was based on capillary blood glucose levels using the 2006 diagnostic criteria recommended by the WHO and IDF. Those participants who had diabetes history, only their fasting blood sugar and anthropometric measurements were taken and the questionnaire was filled. All other participants who did not have diabetes history and had a fasting blood sugar level of ≥ 125 were given an OGTT. Those with a fasting blood sugar level of ≥ 126 were asked to come back the following day to have their fasting blood sugar level evaluated again. The subjects with a blood sugar level of ≥ 126 were diagnosed to have diabetes and were not given an OGTT. Those whose blood sugar level was found to be ≤ 125 in the second measurement were given an OGTT and the results were evaluated according to WHO/IDF 2006 criteria.

5.4% of the study group was found to have a history of diabetes by questionnaire. Following the OGTT the total diabetes and IGT prevalences were found respectively 11% and 18%. Obesity and overweight prevalences according to BMI among Turkish Cypriot Community were found to be 31.6% and 35.4% respectively. In men with waist circumference ≥ 94 cm and <94 cm diabetes prevalences were found 18.6% and 5.8% respectively ($p<0.05$). In women with waist circumferences ≥ 80 and < 80 cm diabetes prevalences were found 15.8% and 3.8 % respectively ($p<0.05$).

In the first study on the prevalence of diabetes among the Turkish Cypriot Community, which was carried out in 1996, diabetes prevalence was 11.3% and IGT prevalence was 13.5%.

According to the results of screening carried out among the Turkish Cypriot Community, it can be said that diabetes continues to be a major health problem and that the increase in the IGT prevalence is an indicator that diabetes prevalence will further increase in the future. In addition to raising public awareness in the efforts to prevent diabetes, we believe that it would be beneficial to identify people with IGT and put them under treatment and observation. Therefore, we are continuing with our efforts to closely follow and treat the patients identified as a result of this study, or those who did not take part in the study but are in diabetes risk group.

Conflict of interest:
Stock ownership: Ektam Kibris
Roche Mustahzarlari AS
Gokce Medical
Evsu
Employee: Health care workers of health centres

P-1640

Smoking history in the study of metabolic syndrome in a sample of Maracaibo municipality: Profiles of risk

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Introduction and objectives: Smoking is a risk factor for cardiovascular disease, cancer and others disease. The objective of this research is to study the prevalence of smoking and its relationship with anthropometric and laboratory parameters in a sample of Maracaibo Municipality.

Materials and methods: A descriptive cross-sectional study in 1400 inhabitants of the Municipality of Maracaibo, selected randomly, who had a complete clinical history, determination of lipid profile, insulin and fasting glucose by venepuncture of 8-12 hours. Statistical analysis was performed using the SPSS program for Windows ver.15. Results were expressed as arithmetic mean ± standard deviation and absolute frequencies and percentages as appropriate. Comparisons were made with one factor ANOVA test and Post Hoc Tukey test considering significant a $P<0.05$.

Results: 16.7% of the sample studied consisted of active smokers, 69.1% non-smokers and 14% smoked in the past. Among the variables with statistically significant differences between the group of smokers, non smokers and former smokers are: basal blood glucose 99.49 ± 27.96 mg / dL, 97.56 ± 22.76 mg / dL and 104.63 ± 30.54 mg / dL ($p<0.01$), total cholesterol 191.47 ± 47.36 mg / dL, 185.86 ± 41.55 mg / dL and 201.58 ± 42.7 mg / dL ($p<0 01$); Triglycerides 154.95 ± 106.05 mg / dL, 116.34 ± 77.22 mg / dL and 148.50 ± 103.18 mg / dL ($p<0.01$), LDL-c 117.73 ± 40 01mg/dL, 116.79 ± 37.25 mg / dL and 128.04 ± 42.58 mg / dL ($p<0.01$); SBP 118.66 ± 13.90 mmHg, 118.66 ± 16.23 mmHg and 123 26 ± 16.30 mmHg ($P = 0001$) and DBP 76.62 ± 10.50 mmHg, 76.65 ± 10.74 mmHg and 79.84 ± 10.56 mmHg ($p<0.01$) only in females abdominal circumference of 94.21 ± 16.42 cm, 88.62 ± 14.15 cm and 96.39 ± 12.95 cm ($p<0.01$), respectively, statistically significant differences.

Conclusions: Individuals with positive history of smoking were found elevated levels of basal glycemia, Triglycerides, LDL-c, SBP, DBP, and female only, abdominal circumference, which suggested that this habit might contribute significantly with the incidence of diseases such as acute coronary events and cancer.

No conflict of interest

P-1641

Prevalence of diabetes mellitus type 2 in adult population of Maracaibo, Zulia State, Venezuela

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Aims: Today, Diabetes Mellitus type 2 is an important cause for discapacity and death in all countries, practically, and constitutes a real epidemic in the world. The prevalence of diabetes has increased impressively during the last two decades. In our locality is not well known yet, for this reason, the purpose of this research was to determine the prevalence of this pathology in Maracaibo, Zulia State, Venezuela.

Methods: It was used a sample of 1400 individuals older than 18 years (male: 45,3%; female: 54,7%), selected through a random number generation utility. A complete clinical history and quantification of glucose, lipid profile and insulin was made. Also, it was realized the statistical analysis in the SPSS program version 15.0. It was used the chi^2 test to prove the association between variables, and the results were expressed in absolute frequency and percentage.

Results: The prevalence of Diabetes Mellitus type 2 in this population was 9,4% (n=131), being higher in females (56,2%; n=73) than males (43,8%; n=57). Related to age groups, the percentage of prevalence were: younger than 20 (5,6%; n=8); 21 to 30 years: (6,3%; n=8); 31 to 40 years: (14,1%; n=18); 41 to 50 years: (30,8%, n=40); 51 to 60 years: (23,4%; n=30); 61 to 70 years (16,4%; n=21); 71 years and more: (4,6%; n=6). Also, it was found an association between the presence of personal history of diabetes and personal history of hypertension (34,6%; n=45), family history of Diabetes Mellitus (64,6%; n=84), and smoking (78,5%; n=99).

Conclusion: It is well seen a significant prevalence (9,4%) of diabetic individuals in Maracaibo's population, being higher in females (56,2%) and age groups older than 40 years (70,6%), justifying more studies to determine the prevalence of this pathology in other population and its prevention on time.

No conflict of interest

P-1642

Thyroid diseases in adult diabetic patients

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Aim: Estimation of thyroid diseases incidence in adult diabetic patients.

Material and methods: Among diabetic patients with diabetes mellitus type 1 (DM1) and type 2 (DM2) diagnosed according to the WHO criteria, there has been isolated a group of patients with thyroid diseases diagnosed based on interviews, physical examinations, imaging examinations and in some cases on thin-needle biopsy, thyroid hormone level (FT4, FT3), thyrotropic hormone, antithyroid antibodies (aTG, aTPO) and TSH-1. The obtained results were statistically handled.

Results: The study comprised of 276 patients (in this 87% women, 107 with DM1 and 169 with DM2). Autoimmune thyroid disease was recognised in 136 patients (80 with DM1), Hashimoto disease in 101 patients, Grave's disease in 35 patients, nodular goitre in 27 patients with DM1 and 113 with DM2, thyroid cancer in 2.8 % (14% with DM2).

Conclusions:

1. Autoimmune thyroid diseases are the most common endocrinopathy related to DM1.
2. Thyroid cancer in patients with nodular goitre and DM2 occurs significantly more frequently than in general population.

No conflict of interest

P-1643

Prevalence of glucose metabolism abnormalities among population of the European part of Russia

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Background: Registered prevalence of T2DM in Russia makes about 2.0%, and the prevalence of the early glucose metabolism abnormalities (IFG, IGT) is investigated insufficiently.

Aim: to study the prevalence of T2DM and the early glucose metabolism abnormalities (GMA) among the adult population of the European part of Russia by the organization of screening the population of the two areas of Moscow County.

Materials and methods: Population-based screening for GMA among 2508 individuals of Moscow County was conducted in 2006. FPG was measured in all the participants. The standard 2-h 75g OGTT was performed using HemoCue analyzers in the subjects previously undiagnosed with diabetes. T2DM, IFG and IGT were diagnosed according to the 1999/2006 WHO criteria.

Results: The prevalence of T2DM and the early glucose metabolism abnormalities depending on gender and age (%) is submitted in the table:

Age, years	men		women		Significance of gender difference		In total	
	T2DM, %*	prediabetes %*	T2DM%*	prediabetes %*	p (T2DM)	p (prediabetes)	T2DM%*	prediabetes %*
18-30	0.98	5.88	0.92	4.59	>0.05	>0.05	0.94	5.00
31-40	0	4.00	2.19	9.84	<0.05	<0.05	1.55	8.14
41-50	0	15.97	4.01	17.19	<0.05	>0.05	2.99	16.88
51-60	11.49	18.39	10.25	15.48	>0.05	>0.05	10.58	16.26
61-70	9.34	24.18	11.14	23.14	>0.05	>0.05	10.53	23.50
Over 70	12.96	28.70	12.43	39.64	>0.05	<0.05	12.64	35.38
In total, %**	6.84	17.76	7.38	17.74	>0.05	>0.05	7.22	17.75
In total, %	24.61		25.13		>0.05		24.97	

* % of an age group among men and women;

** % of a group among men and women.

Conclusions:

1. The prevalence of T2DM among the surveyed population has made 9.4 %, including the first time diagnosed T2DM - 7.2 % that exceeds the given official statistics in 4.3 times.
2. The prevalence of IFG and IGT exceeded the prevalence of the first time diagnosed T2DM in 2.5 times.
3. The persons over 70 years had the maximal prevalence of GMA and it achieved 54.9 %, including T2DM-19.5 %, and IFG and IGT - 35.4 %.
4. The significant gender differences in the total prevalence of the T2DM and the prediabetes were not revealed.

No conflict of interest

P-1644

Diabetes care in a Turkish population at one center

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The aim of this study was to examine the characteristics of our diabetic patients who were hospitalized in our hospital for several reasons. The group consisted of 1777 patients. 977 of them were female (55%), 800 of them were male (45%). 185 of them were Type 1 diabetic (10.4%), 1592 (89.6%) were Type 2 diabetic. When they were questioned for their home address, 1046 (58.9%) of them were living in local area, 731 (41.9%) were referred to our hospital from other hospitals which were out of town. The educational level of these patients was also investigated. 430 (24.2%) were illiterate, 1001 (56.3%) had elementary school, 282 (15.9%) had high school, 62 (3.5%) had university education. These patients were also researched for diabetes education. Only 177 (10%) of them had received diabetes education before. Treatment modalities were as follows: 47 (2.6%) of them were receiving only medical

nutrition therapy, 334 (18.8%) oral antidiabetic treatment, 1379 (77.6%) insülin therapy, 17 (1.0%) insülin and oral antidiabetic treatment. 999 (56.2%) of the patients who were receiving insulin treatment were able to accomplish the insulin injections by themselves, but 412 (23.2 %) of them had needed help from a member of the family. As a result it can be concluded that our center is one of the biggest referral centers for diabetic patients in Aegean region. The educational level investigated in this inpatient group is low. Also only small part of these patients have been educated before for diabetes. Mostly the patients are treated by insulin when they are hospitalized at our hospital. All of these patients are given diabetes education and insulin injection education by registered diabetes nurses. But even with education some patients are unable to apply insulin by themselves.

No conflict of interest

P-1645

One year change in metabolic control in a cohort of type 2 diabetic subjects at the American University of Beirut in Lebanon

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Aim: To describe the change in metabolic control over one year among a cohort of diabetic patients in a tertiary care center in Lebanon.

Methods: Out of 313 subjects initially recruited, a total of 228 with Type 2 Diabetes completed their first year and came back for a second year follow-up. Subjects were first recruited in a cross-sectional manner during their usual diabetic care at the American University of Beirut and their initial metabolic control and presence of complications were described previously[1]. We compare, in this observational cohort study, the changes in metabolic control (HbA1C, lipid profile, urine microalbumin) as well as in anthropometric measures (weight, blood pressure) upon one year follow-up. Paired sample t-test was used for comparison.

Results: Over 1 year, there was a significant decrease in total cholesterol and LDL-C levels by 7.5 mg/dl (p=0.012) and 5.77 mg/dl (p=0.03), respectively. Systolic blood pressure significantly decreased as well by 5.48 mmHg (p=0.000) with a similar trend in diastolic blood pressure (drop by 2.77 mmHg, p=0.003). There was, however, a concomitant drop in HDL-C by 2.16 mg/dl (p=0.001). No significant change was detected in triglyceride level, body weight, urine microalbumin or HbA1c (table). The proportion of subjects with controlled glycemia (HbA1C < 7%) and no microalbuminuria (urine albumin-to-creatinine ratio < 30 mg/gram) did not change significantly from year one to year two.

Variable (unit)	Year1 Mean ± SD	Year 2 Mean ± SD	P value	% change
HbA1C (%)	8.41 ± 2.3	8.36 ± 2.6	0.77	-0.6
Total Cholesterol (mg/dL)	193.0 ± 46.8	185.5 ± 41.7	0.012	-3.9
LDL-C (mg/dL)	116.5 ± 40.5	110.7 ± 36.6	0.033	-4.9
HDL-C (mg/dL)	47.3 ± 14.8	45.1 ± 12.6	0.001	-4.6
Triglyceride (mg/dL)	186.1 ± 122.9	176.5 ± 123.1	0.236	-5.2
Microalbumin/creatinine (mg/gram)	178.6 ± 394.5	209.0 ± 546.3	0.395	+14.6
Weight (Kg)	78.3 ± 16.4	78.8 ± 17.2	0.161	+0.6
SBP (mmHg)	131.9 ± 18.9	126.5 ± 15.8	0.000	-4.1
DBP (mmHg)	78.4 ± 9.9	75.6 ± 9.5	0.003	-3.5

Discussion/conclusions: This study showed improvement in LDL-C and blood pressure which might reflect adequate patients' adherence with prescribed medications. The lack of change in all other metabolic markers and the negative change in HDL-C might be the result of inadequate lifestyle modification, as reflected by the absence of weight loss. We can thus conclude that 1) poor metabolic control remains high in this population of diabetic subjects attending a tertiary care center in Beirut, Lebanon and 2) measures targeting effective lifestyle modification should be implemented aggressively.

Reference: 1- Taleb N, Salti H, Al-Mokaddam M, Merheb M, Salti I, Nasrallah M. Vascular complications of diabetes in Lebanon: Experience at the American University of Beirut. British Journal of Diabetes and Vascular Disease 2008; 8:80-83.

No conflict of interest

P-1646

Epidemiological aspect of prediabetes visiting non-diabetes specialists at University Medical Hospital in Japan

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In 2002, the Japanese Ministry of Health, Labour and Welfare estimated that there were 10.62 million diabetes mellitus (DM) patients in Japan, including 7.4 million DM patients diagnosed and 3.22 million suspected cases. In 2007, this number rose to 22.10 million (8.9 million DM patients and 13.20 million suspected cases, called 'Prediabetes'). Once DM progresses, it damages small blood vessels and leads to severe complications including renal and peripheral vascular disease. This affects an individual's quality of life (QOL), and has a negative impact on the national health economy. With regards to DM, the role of a hospital is to primarily control the blood glucose level and treat severe complications within their specialized DM Department. Patients visiting other departments within the hospital might be overlooked. Since early detection of potential DM patients and intervention is critical, the goal of this study is to develop a program which provides primary prevention and intervention to patients at high risk for developing DM or who are in the early stages of the disease. To this end, we conducted an epidemiological study of potential DM patients who visited non-diabetes specialists at the Nagasaki University Medical Hospital between 2007 to 2008. 3,734 potential DM patients were enrolled in the study including both elderly patients over 65 years of age and young patients below 60 years of age. Our results showed that the percentage of Prediabetes in our study is higher than its statistic data of the Japanese Ministry of Health, Labour and Welfare estimated in 2007, and that patients who are taking steroids are at particularly high risk for developing DM. Early detection of potential DM patients and timely intervention is crucial in preventing the development of DM and protecting the QOL of these patients.

No conflict of interest

P-1647

Diabetes mortality and complication in two Cuban provinces, in the period 1990-2002

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Objective: To know mortality and direct cause of death in diabetic persons in Havana City (HC) and Sancti Spíritus (SS) province.

Method: It was a cross-sectional study carried out on data from the registry of death certified in both Provincial Statistic Departments from 1990-2002.

Results: During this period the diabetes mortality as basic cause rate trend to decrease in both provinces (mortality rate: HC: 24.2 x 100 000 in 1990 to 11.3 x 100 000 in 2002, in SS: 16.4 in 1990 to 8.3 in 2002), by other hands the specific diabetes complications as cause of death decrease, except for renal complication in both provinces (Adjusted rate: in HC: 2.9 to 4.1, and in SS: 3.2 to 3.8), and peripheral vascular complications in Sancti Spíritus. In general, the basic adjusted rates of death for diabetes in the whole period where higher in Havana than Sancti Spíritus. Cardiovascular and stroke conditions were the major complications of diabetes in both provinces (HC: 38.1% & SS 35.7% from total of direct cause of death). The adjusted rate of ketoacidosis and coma, as cause of death, decrease from 2.3 to 1.1 in HC, and from 1.8 to 0.2 in SS. The number of ill-defined cause of the death at the final of period, were several times reduced. (HC from 451 in 1990 to 40 deaths in 2002, and SS from 55 to 5 death in 2002) The major figures were found in females and over 65 years old. We found important differences between above provinces mentioned.

Conclusions: It was confirmed the decrease in mortality in these provinces, as well as, was in the rest of the country, which could be due to the efficiency of the diabetes care program, the decrease of metabolic complications and ill-defined cause of death remark it. It was found that the mortality and the lethal complication of diabetes, in the country, are still heterogeneous in different regions.

No conflict of interest

P-1648

Establishing abdominal diameter cut-offs and association to conventional indices of obesity among Arab children and adolescents

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Aims: This is the first study to document the association of sagittal abdominal diameter (SDI) to measures of obesity among Arab children and adolescents. It aims to identify associations of SDI to indices of obesity among Saudi youth and to establish cut-offs among Arab youth.
Methods: 964 Saudi children aged 5-17 years [365 pre-pubertal (146 boys & 219 girls); 249 pubertal (125 boys & 124 girls); and 350 post-pubertal (198 boys & 152 girls)] were included in this cross-sectional study. Holtain Khan abdominal caliper by Holtain Ltd. (Crymych, UK) was used to measure sagittal abdominal diameter. Other anthropometric measures of interest were measured routinely.
Results: SDI was significantly correlated to indices of obesity regardless of gender, strongest among pubertal boys. For pre-pubertal, the cut-off is 14cm (equivalent to 50th percentile among girls and 60th percentile among boys); for pubertal, 15cm for girls (30th percentile) and 16cm for boys (50th percentile); and for post pubertal, 21.5cm for girls (70th percentile) and 22cm for boys (80th percentile).
Conclusion: SDI is a reliable indicator of visceral obesity among Arab children and adolescents in particular. Further studies should be done to compare its association to components of metabolic syndrome and indices of insulin resistance.

No conflict of interest

P-1649

The metabolic syndrome and associated risk factors in the Johannesburg Metro District

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Background: The metabolic syndrome (MS) cluster represents the most critical risk factors for the development of a myocardial infarction. Estimates suggest that 20 – 25% of the world's adult population have the metabolic syndrome. The chronic metabolic diseases are a growing cause of death and disability in South Africa. While MS is a poorly recognized clinical entity in this country, the individual components of the MS have become more prevalent. Diabetes prevalence rates are higher than the African average at 4-6%. The prevalence of hypertension and hyperlipidaemia in 2007 was 5.5% and 3% respectively. In 2002, despite South Africa's growing concerns of under-nutrition, poverty and infectious diseases, more than 29% of males and 56% of females were classified as obese or overweight. Paucity of South African MS data limits the planning of effective preventative strategies for individual components of MS.
Aim: The study aims to determine the MS prevalence and the risk factors associated with its development in the Johannesburg Metro District, Gauteng Province in South Africa, with a view to reducing the burden of disease in terms of long term management and the development of complications.
Methodology: Study design: Stepwise approach with review of routinely collected District Health Information System (DHIS) data followed by community based survey.
Setting: Johannesburg Metro District the largest metropolitan area in South Africa. The community survey will be conducted in Chiawelo, a homogeneous suburb in Soweto representing all black ethnic groups in South Africa.
Sampling: Routinely collected DHIS data for the entire district was analysed. The community survey will use a stratified randomised cluster sampling technique (sample size=288). Inclusion criteria for the community survey would be residents of Chiawelo who are over 18 years old and have lived in the area for more than five years.
Variables: Analysis of socio-demographic, socio-economic, risk factor, clinical and biochemical parameters would isolate the key determinants of disease development in this community.
Study period: The study will run from January 2009 – February 2010.
Results: (a) Analysis of DHIS data from the Health District showed diabetes and hypertension prevalence at 120 and 200 per 100,000 population (over 45 years). Information regarding hyperlipidaemia and obesity is not routinely collected. Chiawelo Clinic ranked 2nd in the Johannesburg Metro District for the number of diabetics managed from April 07 to March 08.
(b) Community survey results will be available at the time of presentation.
Conclusion: Initial data analysis showed increased prevalence of some components of MS despite scarcity of information. The second phase of this project will provide important information.

No conflict of interest

P-1650

Epidemiologic evaluation and glycemic control of a population with type 2 diabetes, part of a family health program in Curitiba, Brazil

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Aims: To assess glycemic control through the measurement of glycated hemoglobin (A1c) and the main factors that might be associated with it in a population based on a sample of patients with type 2 diabetes in a primary care setting.
Methods: During patient's home visit, a questionnaire was administered asking about lifestyle, oral antihyperglycemic agents and/or insulin treatment compliance; anthropometric data and blood sample were collected for A1c levels. The variables exercise frequencies, diet orientation, medication type, program adherence were correlated with different A1c levels categories through multivariate analysis of correspondence.
Results: One primary care site with a total of 170 patients with type 2 diabetes included in the family health program was selected, 39 patients dropped out, 131 patients were included in this sample, 101 women, 30 men, age ranged from 23 to 84y/o, BMI= 29±6kg/m^2, abdominal circumference 101±12cm, 69% of this population have not completed high school and 87% have family profits under U$500/month. 42% of patients had A1c < 7 and 58% A1c > 7.0%. Among sedentary patients 64% presented A1c > 7, whereas 56% of patients exercising regularly three or more times a week had A1c < 7. The majority of patients (63%) who received diet education have A1c >7, beside 41% of patients who follow dietitian orientation have A1c < 7. Only 39% of patients participating in diabetes education group have A1c < 7, while 61% have A1c > 7.
Patients taking oral agents combination and insulin have had the higher risk with A1c>9%. The best correlation with a good glycemic control (A1c<7) was found in patients taking monotherapy and exercising at least three times a week.
Conclusions: This study was conducted evaluating health family program for diabetes care. Low social economic and education level make difficult patients' compliance for insulin therapy and oral medicine combination, reflecting poor glycemic control in patients with higher treatment complexity. Changes in life style with regular physical activity demands few resources and results in significant improvement of glycemic control in primary care setting.

No conflict of interest

P-1651

Effects of low socioeconomic status on diabetes mellitus: the case of Itapirapua Paulista, Vale do Dibeira, Sao Paulo State, Brazil

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Objectives: Our goal was to establish the relationship between socioeconomic status and the prevalence of overweight and type 2 diabetes mellitus among people of Itapirapua Paulista, city situated in Vale do Ribeira, which is the poorest region of Sao Paulo State, Brazil. The hypothesis was that prevalence of type 2 diabetes would be inversely related to socioeconomic status.
Material and methods: A cross-sectional study was performed by using data from the 2002-2008 Family Health Program conducted by the Brazilian System of Registration and Accompaniment of Hypertensive and Diabetic Patients

(www.hiperdia.datasus.gov.br) in the municipality of Itapirapua Paulista. The evaluated factors were physician-diagnosed diabetes mellitus, hypertension and overweight. Analysis was conducted according to age, gender, race, income level and education level.

Results: A total of 81 diabetic patients including 50 women (61,70%) and 31 women were studied, of whom 65.4 percent are of mixed race and 44.4 % overweight. Other cardiovascular risk factors were essential hypertension (56,8%) and tobacco use (37%). The increased prevalence of diabetes in the most deprived areas was accounted for by increased prevalence of type 2 diabetes in the age band 50-74 years (54%). Only 22% finished the basic education level. There was no association between the prevalence of type 1 diabetes and socioeconomic status.

Conclusion: For certain conditions identified as education level or occupational status, our data confirm an inverse association between socioeconomic status and the prevalence of type 2 diabetes in the middle years of life. Economic resources should be addressed in efforts to explain and reverse the increasing prevalence of diabetes among communities with low human development index.

No conflict of interest

Models of care delivery

P-1652

Saving families time and money: a new model using telemedicine for follow-up care for children with type 1 diabetes

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Regular medical contact is important for optimizing diabetes control. However, it can be time consuming and costly for families.

Aim: The objective of this analysis was to compare time involvement and direct costs for families between conventional face to face clinic visits and phone contact visits.

Methods: As part of a randomized control trial looking at an alternative model care that replaced some face to face visits with a phone visit, information on time involvement and costs to families was collected. Both groups had regular multidisciplinary visits at 0, 6 and 12 months. The conventional group had a physician-only visit at 3 and 9 months while the intervention group had a phone follow-up visit with a diabetes nurse educator preceded by communication of information by fax or internet followed by a phone call.

Results: 82 subjects (39 boys and 43 girls, average age 11.5 ± 3.6 years were randomized to conventional treatment (n=40) or intervention (n=42). At baseline, no significant differences emerged between the two groups for gender, age at entry into the study, age at diagnosis, time since diagnosis, insulin regimen or A1C at first visit in the study. Further, there was no significant difference in traveling distances and time, mode of transport, parking costs, time away from work for parents, or from school for children, between the two groups. However, when a face to face visit is replaced by a phone visit, group differences were found in hours missed from work for mothers (controls 3.4 ± 2.6 hours vs intervention 0.8 ± 0.6 hours, F (1,63)=31.7, p<.001), for fathers (controls 3.3 ± 2.1 hours vs intervention 0.5 ± 0.2 hours, F (1,10)=6.70, p=.027); and for children's time spent away from school for visit (controls 2.3 ± 2.0 hours vs intervention 0.2 ± 0.8 hours, F (1,66)=30.38, p<.001). Traveling time and costs remained the same for the conventional group but decreased to zero for the intervention group.

Discussion/conclusion: Replacing some face to face medical visits with phone visits results in better outcomes for families in terms of decreased time away from regular activities and costs. If found to result in similar medical outcomes in terms of A1C and acute complications and in similar health care providers time involvement, this may be an efficient option for organizing follow-up care for children with diabetes.

No conflict of interest

P-1653

Staged Diabetes Management: improving clinical outcomes in Russia

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Aims: The overall aim was to implement Staged Diabetes Management (SDM), a systematic evidence based approach to the management of type 2 diabetes, and measure its impact on glycemic control in five sites located in Russia.

Methods: Prior to training in SDM, medical centers in Moscow, Krasnodar, Perm, Stavropol and Rostov agreed to undertake a pilot project to measure clinical outcomes in a randomly selected sample of patients. Eleven endocrinologists agreed to randomly select 220 patients with type 2 diabetes and to treat these patients in accordance with SDM clinical pathways (treat-to-target $HbA_{1c} \leq 7\%$) immediately following SDM training. Each site followed the subjects for three months.

Results: Baseline and follow-up data were available for 161 subjects (73%). There were no significant differences in baseline demographic or physiologic measures between patients who completed the study and those who did not return to the clinic for follow-up. At the first clinic visit all patients were measured for glycosylated hemoglobin using a common assay. At that time it was determined that 65% of the patients were treated with sulfonylurea and/or Metformin, 2% with thiazolidinedione and 31% with insulin (pre-mixed); additionally, 97% of the patients used SMBG, averaging 2 tests/day and 98% received education and nutrition counseling. Based on HbA_{1c}, 6% of the patients were at target ($HbA_{1c} \leq 7\%$) and required no further change in treatment. Current treatment was reviewed for all patients exceeding the target. It was discovered that of the 12 patients meeting the criteria for insulin treatment ($HbA_{1c} > 10.9\%$), two were currently prescribed insulin. It was also noted that patients who exceeded target tested less frequently (2 tests/day) than those at target (3 tests/day). Based on these data, treatment was altered by dose or by drug classification in accordance with the Master DecisionPath customized by the endocrinologists during SDM training. Alterations in the current regimen's dose plus initiation of insulin in some patients led to 50% of the patients (81) achieving the target glycosylated hemoglobin within 3 months. Overall, there was a significant ($p<0.0001$) reduction in HbA_{1c} (9±1.6% versus 7.3±1.2%) between baseline and three months at each site and for all sites when data were pooled.

Conclusions: Staged Diabetes Management, a systematic evidence-based approach to diabetes, can be effectively implemented in multiple sites within Russia to produce improvements in glycemic control.

Conflict of interest:
Commercially-sponsored research: Supported by a program development grant from LifeScan

P-1655

Coaching by a dietician: a cost-effective alternative to diabetes management?

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World prevalence of diabetes and associated burden of care and complications are rising. Cost-effective management alternatives are badly needed. Cardiovascular risk (CVR) management by dieticians is one alternative worth assessing over a long term. This 2-year randomized trial aimed to show that dietician-led therapy management with an endocrinologist, for purposes of annual follow-up and advice as needed, enables recommended diabetes outcomes and is less costly than regular care.

Diabetic subjects (n=101, $HbA_{1c} > 7\%$) were randomized to a Dietician-Coached Group (DCG) or a Conventional Group (CG) with follow-up as usual by endocrinologists ± general practitioners. DCG met with coach every 3 months (physical and biochemical measures, exercise, diet and smoking, hypoglycaemia recording, capillary glucose monitoring and motivation), had monthly follow-up phone calls with coach and a yearly endocrinologist follow-up. Variables were taken every 3 months for DCG vs. yearly for CG.

At baseline, groups (DCG n=51/CG n=50) were similar in age (60±10/60±11 yrs), duration of diabetes (16±9/16±10 yrs), systolic and diastolic blood

pressure (sBP: 131±15/131±24; dBP: 74±9/77±10 mmHg), fasting plasma glucose (FPG: 8.8±3.2/8.4 ±3.3 mM), HbA_{1c} (8.1±0.9/8.1±1.1%), triglycerides (1.88±1.28/1.78±1.23 mM), LDL (1.94±0.70/2.03±0.64 mM) and total cholesterol/HDL (3.39±1.16/3.50±1.27 mM). DCG subjects were heavier (BMI: 34±8/31±5 kg/m^2; p=0.03, waist circumference: 113±18/106±12 cm; p=0.03).
At 1 year (DCG n=36/CG n=39), repeated measure ANCOVA showed groups differed for HbA_{1c} (8.0±0.8/7.2±0.8% vs. 8.0±1.2/8.0±1.4%; p<0.001) and waist circumference (113±18/112±19 vs. 105±13/107±13 cm; p=0.03). Moreover, a trend was noted for sBP (130±14/130±26 vs. 121±16/130±14 mmHg; p=0.06), dBP (74±8/69±10 vs. 77±10/77±13 mmHg; p=0.06), microalbuminuria (15±41/8±16 vs. 3±5/9±27%; p=0.06) and fasting plasma glucose (8.8±3.2/7.1±2.6 vs. 8.2±3.1/8.6±5.7 mM; p=0.052).
Dietician coaching seems to be superior to regular care at improving diabetes outcomes and CVR factors. Cost analyses are ongoing.

No conflict of interest

P-1656

Effectiveness of a structured diabetes care program with limited resources

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Rationale: Despite scientific evidence confirming the efficacy of metabolic control in the reduction of the incidence of chronic diabetes complications, worldwide deficiencies in diabetes management are still prevalent. Contributing factors include lack of coverage or limited access to public/private services, scarcity of diabetes educators, organizational deficiencies, scarce economic resources, and shared lack of effective interventions by current systems of care, providers of diabetes health care and their patients.
Objective: Investigate the effectiveness of a structured program on the quality of outpatient diabetes care at the primary level and with very limited economic resources in Mexico.
Patients and methods: A prospective study was conducted in diabetes patients treated at outpatient diabetes clinics established in 2001-2007 as the state diabetes program in Hidalgo Mexico, one of the poorest states in the country, with a mostly rural population. Baseline and follow up consultation was provided by multidisciplinary teams including general physicians and nurses as a minimum. Goals of treatment were clearly explained and negotiated with each patient. Organizational arrangements were made to reduce waiting times, avoid rotation of doctors and nurses, and provide adequate time for baseline and follow-up visits. Each follow-up visit included measuring process and outcomes indicators of quality of diabetes care, including: 1) body mass index; 2) blood pressure; 3) fasting or casual blood glucose 4) lipoprotein measurement; 5) hemoglobin A1c (HbA1c); and 6) foot examination.
Results: Analysis of 4,393 patients who attended five visits showed the following increases in the percent of recorded process indicators of quality of diabetes care from baseline: 1) body mass index, 85.0 vs. 95.9%; 2) blood pressure measurement, 73.29 vs. 95.6%; 3) HbA1c 12.5 vs. 17.7%; 4) total cholesterol, 18.2 vs. 55.9%; 5); 6) foot examination, 19.0 vs. 95.0%. Outcome measures that showed non-statistically significant differences were body mass index (27.79±4.9 vs. 27.82±4.76), systolic blood pressure (124.7±21.36 vs. 123.54±19.27 mmHg), total cholesterol (193.50±47.94 vs. 208.41±54.02 mg/dl) and triglycerides (258.2±231.5 vs. 244.7±181.6 mg/dl). Significant improvements in glycemic control were documented by a decrease in fasting blood glucose (185.75±79.01 vs. 162.89±72.53 mg/dl, P <0.001), and a 3.6percentage point decrease in HbA1c (12.05%±4.47 vs. 8.45±1.89, P 0.001).
Conclusions: The results confirm that it is possible to improve the quality of diabetes care at the primary care level without additional economic resources, through the implementation of a program that integrates changes in the structure and in the process of care, customized clinical guidelines, and a standardized system of information that enables measuring clinical results in settings with limited resources.

No conflict of interest

P-1657

Treating 4000 diabetic patients in Cambodia, a high prevalence but resource limited setting: five year program outcomes

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Background: Despite the worldwide increasing burden of diabetes, there is no corresponding scale up of treatment interventions in developing countries and there is limited documentation on program effectiveness. In 2002 Médecins Sans Frontières in collaboration with the Ministry of Health of Cambodia initiated a program to provide subsidized diabetic care on an out-patient basis in two hospital-based chronic disease clinics. The objective of this study was to describe program outcomes of patients enrolled in care.
Methods: This was a descriptive study of outcomes of 4000 diabetic patients treated over five years. Diagnosis and treatment were standardized. Blood glucose, blood pressure, and BMI were measured at each quarterly visit. Random blood sugar (RBS) was used for monitoring from 2002 to 2007, when HbA1C was begun. We calculated the proportion of patients who met the recommended treatment targets for RBS, HbA1c, blood pressure, and BMI and examined the evolution of these parameters over time. We used t-test to compare baseline and subsequent paired values.
Results: Of 4404 patients enrolled, 2872 (65%) were still in care, 24 (0.5%) died and 1508 (34%) were lost to follow up (LFU). The mean age was 53 years, 66% were female and 99% had type 2 diabetes. Median follow-up period was 20 months. Nearly 50% (740/1544) of patients had an RBS<145 mg/dl after one and a half years and 24% (51/213) had HbA1c<7% by 18 months of treatment. Forty-five per cent (377/836) and 76% (88/116) of patients with systolic and diastolic hypertension at baseline respectively, reached the treatment goals of ≤130/80mmHg within one year. There was a significant drop in mean RBS [106 mg/dl (SD:136) P<0.001], mean HbA1c [-2.6 (SD:3.1) P<0.001], and mean blood pressure [SBP −13.5mmHg (SD20.7) and DBP −11.7mmHg (SD12.1) P<0.001] between baseline and six months, but not in BMI. Factors associated with LFU were male sex, age >60 years, living outside the province, normal BMI on admission, high RBS on last visit, and coming late for the last consultation.
Conclusions: Significant and clinically important improvements in glycaemia and blood pressure were observed in this programmatic setting in rural Cambodia, but a relatively low proportion of diabetic patients reached the recommended treatment targets. These results and the high defaulter rate highlight the challenges of delivering diabetic care in resource limited settings.

No conflict of interest

P-1658

Improving diabetes care in Nova Scotia through a Provincial Program Model

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Background: Established in 1991, the Diabetes Care Program of Nova Scotia (DCPNS) is a Provincial Program funded by the Nova Scotia (NS) Department of Health (DoH). Guided by an Advisory Council and a number of committees, the DCPNS advises on service delivery models; establishes and monitors adherence to DM guidelines; provides support, services, and resources to DM healthcare providers; and collects, analyzes, and distributes DM data for NS. Program priorities have evolved over the years to reflect provider and health system needs.
Aims: To improve, through leadership and partnerships, the health of Nova Scotians living with, affected by, or at risk of developing DM.
Methods: The DCPNS works closely with the province's 9 District Health Authorities (DHAs), 39 Diabetes Centres (DCs), and DM care providers to influence practice. Program staff and dedicated fiscal resources, as well as a number of groups with membership reflective of both urban and rural practice (Pregnancy, Pediatrics, Best Practice, and Long Term Care) ensure the interests of the DoH, DHAs, and special populations. A provincial registry, built and supported by the DCPNS, gathers population & clinical data from DCs to

inform policy and provincial initiatives. DCPNS initiatives (grants, workshops, newsletters, practice tools, and annotated bibliographies) support networking, knowledge transfer, sharing of lessons learned, and the uptake of guidelines.
Results: Standardized documentation forms (including referral, assessment, and flow sheets for adult, pediatric, and pregnant populations) as well as data collection tools have been in use since 1992. Guidelines for special populations (pregnancy, pediatrics, frail elderly), specific complications/comorbidities (HTN, dyslipidemia, and foot problems), and care protocols (insulin dose adjustment) have been implemented. The DCPNS Registry contains over 70,000 cases of DM/prediabetes, and provides data for local use to support quality improvement. Improvement in clinical measures has been documented, e.g., for DC follow-up attendees, 50% now have BPs within target (<130/80). Insulin initiation by DCs' staffs has also increased over 300% since 1992. Since 2005, 20 DC grants have been funded leading to practice innovations and efficiencies.
Discussion: The DCPNS ensures that Nova Scotians have local access to quality DM programs and services. DCs, regardless of location, are measured by the same standard. DC staffs are supported and have ready access to new knowledge. Over 70% of estimated NS DM cases are found in the DCPNS Registry. The availability and use of local data has resulted in program change, targeted interventions, and improved clinical measures.

No conflict of interest

P-1659

Application of Disease Management for diabetes: a patient centered approach

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The protocols of the integrated care (IC) applied up to now foresee a strong integration between a specialistic structure and a General Practitioner (GP), but still with insufficient participation of the patient. The hypothesis proposed is that the centrality of the person is the essential element for the success of the entire treatment process
Aim: To implement a model that foresees various possibilities of contact of the patient with the team; to present the relevant data to the results obtained from 2002 to 2008 by applying this model of Disease Care strongly centered on the patient.
Methods: Our Unit has a team (3 Diabetologists, 2 nurses, 1 diet expert) that has reorganized diversifying all the activities in distinct pathways:
Clinical Pathway: the objective is the optimization of the metabolic parameters and the prevention of the complications (by doctors and by the paramedic staff). Activity: visit, advising to the MMG for acute problems, particular therapies, and podologic outpatients' center.
Welfare Pathway: the objective is the self-management of the patient.
Activity: dietology, devices, course of Therapeutic Education, individual education.
The two processes are autonomously performed but can entwine to optimize resources and intervention.
Telemedicine Pathway: the objective is the control and the quick recovery of the patient. At every meeting the self-control and the tests performed are checked. In this way the patient learns and verifies his ability of self-management and is thus protected from criticalities and/or urgencies that he is unable to recognize and face alone. In fact the operator that meets him can at any time reintroduce the patient in the medical process. At any moment either the patient or the MMG can be connected using the telemedicine pathways as consulting channels or re-insertion in the control system.
Results: Of the 2586 active patients in our structure, 1422 are in IC in accordance to «our model». All the indicators of clinical effectiveness at the end of the period of observation are overlapped to the incoming data and they have shown to be in line with the standards proposed by the American Diabetes Association (ADA). The average values of the group in GI: HbA1c= 6,98%, FBG=134 mg/dl; PPBG=129 mg/dl; LDL=108 mg/dl (standard ADA demands <7%; <130 mg/dl; <180 mg/dl; <100 mg/dl respectively). The time analysis of the data of the patients with a longer follow up, has permitted to evidence that the worsening of the differential indicators is clinically irrelevant. The adhesion to the proposed model is excellent (2,5 % drop out).
Saving 51,1% of the medical time allowed us to slow down the saturation point of the entire system achieving nevertheless a good effectiveness (a constant trend of acquisition of about 300 new patients/year; 4040 access in 2006 versus 4903 in 2008).

No conflict of interest

P-1660

Joint Asia Diabetes Evaluation (JADE) Program – a web-based program to translate evidence to clinical practice in type 2 diabetes

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Aims: The Joint Asia Diabetes Evaluation (JADE) Program is the first web-based program incorporating a comprehensive risk engine, care protocols, clinical decision and self management support to improve ambulatory diabetes care. We validated the risk stratification system of the JADE Program using a large prospective cohort.
Methods: The JADE interactive risk engine stratifies patients into different risk levels using results from an annual comprehensive assessment of complications and risk factors. The risk engine makes use of the following 4 clinical entities to derive the levels: cardiovascular-renal complications, conventional risk factors for diabetic complications, estimated glomerular filtration rate and the Hong Kong Diabetes Registry risk scores to predict complications. We used a prospective registry consisting of 7534 type 2 diabetic patients [45.6% men, median (range) age: 57 (13-92 years)] to perform internal validation of the risk engine.
Results: The JADE Risk Engine categorized patients into 4 risk levels (from low to high): Level 1, n=4520 (6%); Level 2, n=1468 (19.5%); Level 3, n=4476 (59.4%) and Level 4, n=1138 (15.1%). After a median follow-up period of 5.50 years (mean ± SD: 5.42 ± 2.81 years), 763 (10.1%) died, 1129 (14.9%) developed cardiovascular disease (CVD), 282 (3.7%) developed end-stage renal disease (ESRD) and 1400 (18.6%) had at least one of these events. Compared to risk level 1, levels 2, 3, 4 were associated with 2.8, 4.7 and 8.6 fold increased risk of clinical endpoints. Risk levels 3 and 4 were respectively associated with 2.2 and 3.9 fold increased risk for all-cause death and 4.8 and 12.1 fold increased CVD risks. The respective 5-year absolute risks of death or cardiovascular-renal events were 2.5%, 8%, 21.5% and 60%.
Conclusion: Based on results from a comprehensive assessment, the JADE Risk Engine successfully categories patients into different risk levels to guide clinical management.

Conflict of interest:
Employee: F. Le Coguiec, B. Tamesis, G. Lyubomirsky and T. Wolthers are employees of Merck Sharp & Dohme (MSD), a subisdiary of Merck & Co. Inc., USA

P-1661

Can an inpatient blood glucose management team impact post-discharge glucose control

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Blood glucose (BG) control is well known to improve outcomes in elective surgical inpatients and has become standard of care in cardiothoracic surgery, although BG goals remain controversial. Following a major procedure the patient is a captive audience to standard glucose management practices. This allows an inpatient blood glucose management team to reinforce and reeducate a patient on diabetes care issues. The impact of such a team on the maintenance of glycemic control after discharge has not been examined or analyzed
Aim: The Hospital Insulin Program (HIP) at a large academic center recently set up an outpatient clinic to manage BG in post-discharge cardiothoracic and vascular surgery patients. Our aim is to study the impact of inpatient glucose management and education on patient's ability to obtain better glycemic control with a more intense regimen upon discharge.

Methods: We performed a retrospective analysis of post-surgical patients with diabetes mellitus seen by the HIIP clinic in 2008. A chi-squared test was performed using SPSS.
Results: Mean patient age was 61.8 ± 7.8 years and 69% were male. Average hemoglobin was 11 ± 1.7 g/dl. Time between pre-operative HbA1c to last clinic HbA1c ranged from 2 weeks to 6 months and 30% of patients had 2 or more clinic appointments.

Table 1

	Number of patients	Mean pre-operative HbA1c	Mean post-operative HbA1c	Difference in HbA1c from pre-operative level	p-value
Whole group	39	7.91%	6.65%	1.26	<0.01
Subgroup-follow-up >2.5 months	14	7.56%	6.58%	0.98	0.02

We found a statistically significant reduction in average post-operative HbA1c level of the group as a whole. This decrease was maintained in the subgroup that had a >2.5 month follow-up (Table 1). HbA1c reduction was greatest in patients with the highest pre-operative HbA1c. Sixty-one percent of patients were controlled with diet or oral hypoglycemic agents before surgery. Post-operatively, 97% had adopted a regimen of basal insulin with an oral agent or bolus meal insulin.
An intensive inpatient insulin regimen can lead to a reduction in post-operative HbA1c which partly reflects their tight BG control in the hospital. For the subgroup of patients with follow-up after 2.5 months, the sustained decrease indicates good outpatient BG control. Post-discharge, most patients remained compliant with diabetes regimens of much greater intensity than their preoperative ones. For patients with diabetes mellitus the inpatient admission provides a unique opportunity to refocus on their BG management practices, therapy and goals. Larger studies with prolonged post-operative follow-up are needed to demonstrate ability of the inpatient encounter to improve post hospital diabetes management.

Conflict of interest:
Paid lecturing: Roma Gianchandani
Speaker's Bureau, Sanofi-Aventis

P-1662

Diabetes task force Programs "Insulin for Life" and "Life for a Child" activity in Uzbekistan

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Aims: Adequate insulin therapy and self-monitoring permit good glycemic control, reduce diabetes complications and prolong active life of people with Diabetes Mellitus (DM). Since 2004 Diabetes task force teams "Insulin for Life" (IFL) and "Life for a Child" (LFC) provided insulin aid and supply for patients with DM especially to children and adolescents. This observation aims was evaluation of the glycemic control of people with DM, who were accepted on IFL and LFC programs.
Methods: In 258 adults, 62 children with DM, fasting (FG) and 2 hour after meal blood glucose (2HG), HbA1c levels were measured and self-monitoring test score were observed at start and after 6 month. Control group presents from 12 healthy subjects (HS). All people were treated with insulin and controlled blood glucose level by test strips and/or meters from IFL and LFC, all patients were educated at the regional diabetes centres where they were tested according to questionnaire in the start and end of observation. Observation was done in 4 regions, where insulin and supply was distributed.
Results: The level of FG, 2HG, HbA1c obtained on start of observation were significantly increased on 36%, on 32%, and 27% subsequently in compare with HS and indicated poor glycemic control in DM patients, average self-monitoring score was 2. Patients re-observation after 6 month shown significantly decreasing the level of FG on 1.57 times, 2HG on 1.7 times and HbA1c on 1.4 times, whereas self-monitoring score was increased till to 8. Through anamnesis at the start of observation were detected that 26% children had frequent ketoacidosis, and 38% patients had frequent hypoglycemia episodes, and after 6 months observation no one had ketoacidosis and hypoglycemia were dropped till to 4%. In start of observation only in 54% of people with DM treated intensively and during the program all patients was on intensive insulin therapy and daily insulin doses increased to 37%. During this time patients-doctors cooperation, and number of new regional associations increased.
Conclusion: In people with DM accepted to IFL and LFC program after 6 month intensive insulin therapy and self-monitoring significantly decreased the levels of FG, 2HG, HbA1c and increased the self-monitoring test score records to 4 times. Adequate long term insulin therapy and insulin supply with patient education are important factors in achieving of best glycemic control. Moreover, insulin aid and supply which provide by IFL and LFC help to rise patient-doctors cooperation and facilitate the patients to unite in associations.

Conflict of interest:
Other substantive relationships: We express our acknowledgements to Ron Raab, Neil Donelan, Alicia Jenkins, Heidy, Yan and Faya from "Insulin for Life "and Graham Ogle from "Life for a Child" and to Wim Wientjin and Netherlands Association, to Marjatta and Finland Diabetes Association and of course to IDF for drive and support this program

P-1663

A computer-based monitoring tool for a large scale diabetes care program in Cambodia

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Aim: Cambodia is a resource-constrained country with a high prevalence of diabetes and limited access to care for the great majority of diabetic patients. In 2002 Médecins Sans Frontières, in collaboration with the Ministry of Health of Cambodia, initiated a program to provide subsidized care for diabetic patients in two hospital-based chronic disease clinics. A computer software tool was developed to facilitate data collection and analyses at the patient and programmatic level, to monitor the diabetes program.
Methods/software features: Microsoft Visual Basic® for Application (VBA) was the underlying programming language and Microsoft Access® 2003 was the core of the program. The main technique used was splitting database into a front-end application and a back-end database. Specifications were written to ensure an "open" product that could be adapted to work in other database environments (such as Microsoft SQL Server®, etc.) without substantial modifications.
The software was designed to allow for modifications of all major parameters by the user (drug lists, laboratory results, screening tests etc) in order to be adaptable to different contexts. Standardized patient files were created for use in the clinics (admission forms and follow-up forms) and for entry into the database. Reports were standardized and included: patient summary, outcome reports (proportion of patients reaching treatment targets) and main outcomes including deaths, complications, loss-to-follow-up and transfer-outs. The software was planned to be available free, providing open-access to the Ministry of Health, non-governmental organizations and other actors involved in care of patients with diabetes.
Results: The software has been used for over six years in two clinics delivering care to over 4000 patients with diabetes. Clinicians and programme managers were able to access the database easily and analyze data on a monthly, three-monthly and annual basis, for the assessment of individual patient progress as well as for the evaluation of program performance. The software was user-friendly and did not require special computer skills for the data entry and analysis. However, the high patient load and high frequency of follow-up consultations (on quarterly basis) required that data entry of new admission and follow-up visits be performed by full-time data clerks on a daily basis.
Conclusions: A simple, user-friendly, computer software tool for diabetes patients was developed in a programmatic setting in Cambodia. The monitoring tool was field-tested for several years and is free-ware and open-access. Nevertheless, it requires additional human resources for data entry and database maintenance if it is to be used by large scale programs or for monitoring of large cohorts of patients.

No conflict of interest

P-1664

Targeting diabetes prevention in an interactive, innovative and patient focused multidisciplinary metabolic syndrome program

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Aim: Successful self-management of cardiovascular and diabetes risk factors requires risk assessment, identification and diverse self-management strategies for effective risk reduction. Best practice for diabetes prevention interventions is unknown. We developed and implemented the first metabolic syndrome program in Canada targeting intensive risk reduction through self-management support.
Method: Participant referral may be from physicians, allied health professionals or self-referral. This multidisciplinary, nurse-managed physician supported program includes a clinical nurse specialist, patient educator, dietitian, exercise specialist, occupational therapist, physicians and psychology support. Behaviour change strategies target physical activity, nutrition, weight management, psychosocial risk factors, and self-management. This program is 18 months in duration and includes a minimum of 17 visits. Interactive group sessions are enhanced with prescheduled individual follow-up visits at baseline, 6, 12 and 18 months with the multidisciplinary team members.
Results: FBG at baseline 5.9 (5.5, 6.5), N = 228, at 12 months 5.9 (5.4, 6.4) N = 147, p = 0.10. Weight (kg) at baseline 98.0 (84.3,115.9); at 12 months 92.3 (79.5,106.4) N = 144, p=0.002. Waist circumference (cm) at baseline 112 (102,124,), at 12 months 106.0 (96.0,115.0), N = 133, p <0.0001. TC at baseline 5.5 (4.8, 6.3), at 12 months 5.2 (4.3, 5.8), N = 147, p =<0.001. LDL at baseline 3.3 (2.7, 3.9), at 12 months 3.1 (2.3, 3.6) N = 145, p = 0.008. HDL at baseline 1.2 (1.0, 1.4), at 12 months 3.1 (1.2 (1.1, 1.5), N = 147, p = 0.03. TG at baseline 2.0 (1.5, 2.8), at 12 months 1.7 (1.2, 2.5), N = 147 p =<0.0001. SBP at baseline 130 (0.7), at 12 months 121 (1.1), N = 140, p <0.0001 and DBP at baseline 80.5 (0.4), at 12 months 75.9 (0.7), N = 140, p <0.001.
Conclusion: This new innovative model incorporates key multifactorial strategies for diabetes prevention. We conclude that this comprehensive multidisciplinary program meets the needs of both participants and communities for effective chronic disease prevention. Further evaluation of long term program outcomes and community based partnerships need to be explored.

Conflict of interest:
Paid lecturing: S. Chan, A. Ignazsewski, G. bondy, J. Frohlich - Astra Zeneca

P-1665

Local outpatient educational units creation: interest in gestational diabetes mellitus management

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Aims: Improve GDM diagnosis and access to appropriate care pathway management and delivery with local outpatient educational units creation through a coordinated network.
Methods: Through a coordinated network commited to provide a high quality care across the local health organisation that is diabetic centred and responsive to local need, our goal was to promote early diagnosis and to improve treatment and outcomes for women with GDM: -collaboratively work with public and private partners (4 hospitals, 4 towns), medical doctors (general practitioners, obstetricians and diabetologists), nurses, dietitians and midwives to develop and to implement recommendations –building on any links with them in their local areas –proximity educational units (n=4) creation, organised on a non hierarchical basis around common concerns with structured education programs.
Results: Since 4 years: 418 women with GDM were detected and followed, mean age 31,1±5,3 years. Among them, 39% had family history of diabetes, 60% were multiparous with pre-existing GDM (26%) and macrosomia (15%). At conception there weight had more 6,3 kg than form weight, BMI: 28±8 among them 49,7% with BMI <25. Before delivery: weight gain: 12±6,3 kg and 33% had insulin treatment. At delivery: 30% caesarean sections, postnatal maternal complications 4%, 12 days before predicted term. The offspring: birth weight: 3,27±0,50 kg, 7,6% macrosomia, 10% postnatal complications (2,3% link with DG), 2,5% malformations. At 10 weeks post partum 70% women were screened by a 75 g OGTT: 7% remained diabetic and 29% had impaired glucose tolerance.
Discussion/conclusion: This health organisation allowed the involvement of medical professionals and patients, promoting early diagnosis of GDM, followed by structured education and self management program. With a diabetes network, the creation of local outpatient educational units permitted the GDM diagnosis and to manage and deliver individually appropriate care pathway.

No conflict of interest

P-1666

An innovative and targeted approach to chronic disease prevention and management – Alberta Health Services initiative

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Background: Canada is ethnically, culturally and socially diverse country. Although diverse, one characteristic shared by specific populations in Canada is their increased risk for developing diabetes and cardiovascular disease. Individuals of South Asian, Hispanic, African and Aboriginal ancestry and those experiencing poverty and homelessness in particular are disproportionately afflicted by diabetes and other chronic conditions, a grossly under-estimated reality which has not been adequately addressed in health care surveillance, planning and provision in Canada and worldwide. There is a serious lack of targeted and coordinated chronic disease programs addressing the unique needs of diverse and medically under-served populations. This hinders health care system's efforts in combating the emerging epidemic of diabetes and other chronic conditions. Since 2002, the Alberta Health Services, Calgary area, has developed an innovative and targeted chronic disease prevention and management program for diverse populations.
Program aim: The aim of the program is to ensure that diverse populations with diabetes and other chronic conditions do not experience barriers accessing mainstream services. The specific objectives are to: strengthen the role of the community and patients in service development and delivery; enhance patient's self-management capacity; improve health outcomes and access to appropriate and socio-culturally competent chronic disease services; and decrease the rising burden of chronic diseases on the health care system.
Methodology: The program has adopted Chronic Care Model developed by the MacColl Institute for Healthcare Innovation as its framework. The model has been modified to meet the unique needs of the ethnically, culturally and socially diverse populations. The key components of the program include nurse case management, self-management support, community-based education, and specialty clinic expertise. The program objectives are achieved through delivery of socio-culturally competent and coordinated services delivered by multi-disciplinary and multi-lingual teams in accessible community-based settings such as temples, mosques, homeless shelters, cultural and community centres. Currently, services are offered to the South-Asian, Chinese, Filipino, Vietnamese and homeless populations.
Results: The evaluation results show significant improvements in access, clinical outcomes, service utilization in terms of decreased in-patient and emergency department admissions and patient-provider satisfaction.
Conclusions: This innovative, targeted approach which focuses on the determinants of the health, is effective in optimization of services, increased access and improved health outcomes. Strong community partnerships are instrumental in the success, acceptability and accessibility of the program.

No conflict of interest

P-1667

Glycaemic outcome and acceptance of knowledge-based decision support in diabetes care is strongly related to HbA1c at baseline

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Background and aim: The Diabetiva® program launched 2006 by the German insurance company BBK TAUNUS offers continuous glucose monitoring (CGM) and decision support generated by the Karlsburg diabetes management system KADIS® to their insured diabetics. Diabetiva® is open for diabetics with

cardiovascular risk and focuses on improvement of routine out-patient diabetes care according to the guidelines of the German Diabetes Association. We addressed the question, whether acceptance of decision support and metabolic outcome differs between general practitioners (GP) and diabetes specialists (DSP) involved in the Diabetiva® program.

Materials and methods: The Diabetiva® timeline includes an annual CGM followed by decision support for therapy optimization and quarterly medical check-up including HbA_{1c} detection. Patients with two CGM readings (n=150) were retrospective analyzed for acceptance of the KADIS®-based decision support by the GP/DSP using a questionnaire and the outcome of the Diabetiva® program, with HbA_{1c} as primary outcome parameter.

Results: After running Diabetiva® for 20 months 538 insured diabetics (95.9 % Type 2 diabetes) were enrolled and had received 727 CGMs. Patients were cared for by 276 GPs and 40 DSPs. Approximately 67 % of physicians accepted KADIS® as patient-focused support to optimize diabetes therapies; 36 % used the therapeutic regimes without changes and 31 % used slight modifications. Thirty percent did not accept KADIS®-based decision support. Logistic regression revealed that KADIS® acceptance was dependent on HbA1c at baseline ($p<0.05$). GP or DSP type of therapy had no significant influence whether on acceptance or on outcome parameters. Multiple regression analysis revealed that HbA1c and secondary outcome parameters 20 months after enrolment into Diabetiva® depend only on acceptance of KADIS® and on HbA1c at baseline ($p<0.001$). Again, GP or DSP type of therapy, age, onset of diabetes, BMI, and gender had no significant influence on the outcome parameters. If KADIS® was accepted for routine diabetes care HbA1c could be decreased (HbA1c at baseline < 6.5: -0.11 ± 0.05 %, p=0.04; 6.5 – 7.5: -0.47 ± 0.09 %, p< 0.001; > 7.5%: -0.97 ± 0.13 %, p< 0.001), whereas if KADIS® was declined the impact of Diabetiva® was diminished (HbA1c at baseline < 6.5: +0.40 ± 0.01%, p<0.001 %; 6.5 – 7.5:+ 0.17 ± 0.10 %, n.s.; > 7.5%: -0.29 ± 0.40 %, n.s.).

Conclusion: Decision support is accepted by GPs and DSPs especially for diabetics with elevated HbA1c. KADIS® in combination with continuous glucose monitoring and telemedicine-based communication can be a useful tool for providing effective management of diabetes.

No conflict of interest

P-1668

Reduction of diabetes ketoacidosis in children with type 1 diabetes mellitus in Dar Es Salaam, Tanzania

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Type 1 Diabetes Mellitus (T1DM) is a growing concern worldwide. While there has been a great development in the management of this condition in the developed world, there has been little or no improvement in sub-Saharan Africa. The burden of this disease is not known, but there is an obvious difference in the outcome. Tanzania is currently experiencing a rise in childhood diabetes as the rest of the world.

The major challenge lies in glycaemic control, and the rate at which new cases of diabetes are emerging poses an additional burden. The impact of T1DM in children is bound to continue if nothing is done. Activities to raise public awareness including World Diabetes Day, media events, other national campaigns, etc and have helped a lot in improving the management to be exact at least early diagnosis of children with Diabetes. Tanzania was among the countries which were given support in an IDF child sponsorship program.

Methods: We did an audit of the clinical data of children and adolescents with T1DM attending Muhimbili National Hospital diabetes clinic, under the sponsorship of IDF from 2005 to date. The clinical data of 126 children and adolescents aged 10 months to 23 years, attending the clinic were assessed. We looked at the prevalence of DKA at the time of diagnosis and after the initiation of insulin. We then looked at the age of diagnosis of the new patients and the glycaemic control. We then compared the data of 2005 (at the beginning of the programme) and after.

Results: Data of 126 children was assessed. Among these 61 (48.2%) were females and 65 (51.5%) were males. Mean age was 12.3±3.7 years. There were 27 new patients diagnosed between Dec 2005-december 2008. Among the 27 patients, 9 (33.3%), presented in DKA at the time of diagnosis compared to 74 (75%) patients before 2005. DKA after the initiation of insulin reduced to 42 (33.3%) from 89 (89.9%) in 2005. Age at diagnosis was 8.8±3.8 compared to 13±3.5 years in 2005. The mean HbA1c was 12.1±2.4%, compared to 12.3% in 2005. Only 3 (2.3%) patients died due to DKA during this period from 2005-2008.

Conclusion: Diabetes care in developing countries needs to address the specific background of the patient population, their needs, medical problems and social constraints. Active participation of patients, families, the community, media, governmental and non-governmental organizations, and health workers can overcome some of the difficulties. In a setting where the Diabetes is still superseded by infectious diseases, public awareness will lead to early diagnosis, less complications and improvement in life expectancy.

Finally the provision of insulin, will not give these children the good glycaemic control as soon as we wish, but at least, it reduce the acute complications we were seeing before.

No conflict of interest

P-1669

A novel initiative to "Bridge the Gap" in reducing patient wait times for diabetes assessment

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Valentine (2000) notes that Diabetes Educators play an important role in assessing and educating people about diabetes, however, they are often underutilized. Diabetes educators may improve wait times for people awaiting consultation by an Endocrinologist by facilitating early assessment and education. The Diabetes Care Centre at St. Michael's Hospital has restructured current programming in an effort to address current wait times for patients newly referred to an Endocrinologist. Typically, the average wait times for a new non-urgent referral range from 2-6 months. The Diabetes Care Center (DCC) team has implemented a new intake assessment program where patients newly referred to an Endocrinologist are pre-screened by both a Registered Nurse and Dietitian. This intake program has afforded the DCC staff the opportunity to identify patients' who need to be seen urgently, address patient educational needs prior to physician appointments, and, to implement a standardized process to ensure that patients are triaged into appropriate diabetes education support services in the interim while they await their appointment with the Endocrinologist. As a result of this new program, current wait times to be assessed by a health care professional in the DCC are now 2-3 weeks versus 2-6 months to see an Endocrinologist without any prior diabetes assessment or education. This novel program has improved patient services and ensures that all patients referred to the DCC receive early assessment and education. A triage tool has been created by the DCC team to standardize approaches to referring patients to DCC programming, and to determine those patients requiring urgent endocrine assessment.

Valentine, V., (2000). Educational Strategies at Diagnosis and Beyond, or Diabetes, Type 2, and what to do! Diabetes Spectrum (13) 197.

No conflict of interest

P-1670

Community based prevention and management of diabetic foot complications in the Philippines

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Introduction: Undetected and neglected diabetic foot complications are one of the leading causes of disability and amputation in Davao City, Philippines (1). Handicap International in collaboration with relevant partners and the City Health Office is conducting a pilot project on diabetes management and awareness in Davao City.

To better address the diabetic foot issue, the assumption of the project was that the community health workers (CHW) could be enabled to do basic foot risk assessment to categorize risk levels and refer for further medical treatment if needed, and basic patient foot care eduation, and be taught to make simple pressure relieving foot orthosis in a pre ulcerative foot.

Objective: To pilot test the implementation of a community based strategy for prevention, identification and management of early stages of diabetic foot complications in the 10 pilot communities in Davao City in the Philippines.

Methods: 84 community health workers have attended the Training workshops and in-community follow up training with regular monitoring of the practices of skills gained from the training.
The use of a one day intensive theory and practical workshop for knowledge transfer established the core information needed for the foot care and foot risk assessment training. This was followed by in-community training workshops.
The simple pressure relief orthosis were made from readily available innersole material from local shops.
The CHW were also encouraged to use a referral system to refer any more serious cases to health care professionals and a local partner trained in orthotics and prosthetics production.
Results: The training effectiveness and impact has been assessed by means of a checklist and frequent monitoring in the community.
The results of the assessments have been collected from post training activities. The results have demonstrated an increased awareness and knowledge in diabetic foot care practices, with an increase in the number of tasks completed on the checklist that is used to assess the diabetic foot.
This has resulted in two cases whereby foot ulcers have been prevented from progressing, and through frequent monitoring by the CHW they have closed and healed.
Conclusions: Community health workers can play a key role in the prevention and management of diabetic foot and its related complications.
With appropriate training, CHW are able to provide an affordable and early intervention by use of simple innersoles to help prevent further foot complications.
The training further empowers the CHW to provide patient education to create greater awareness of the serious nature of diabetic foot complications and their consequences in the community.
(1) Davao Medical Centre Hospital – Ortho Dept figures July 2007 to December 2008

No conflict of interest

P-1671

Patients with diabetes mellitus (DM) undergoing elective surgery – management in primary care

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Introduction: Patients should have stable DM at least 3 months before surgery. Maintaining acceptable glycaemic control in patients with DM can be challenging especially when there is a short period of time and no clear pathway to follow.
Aim: Assess management of patients with DM in primary care referred and scheduled for elective surgery.
Methods: Retrospective study undertaken in one of the General Practices in the West Sussex, United Kingdom. All patients (90) with DM who underwent operations under general anaesthetic between January and October 2007.We looked for relevant blood work-up and way of optimising patients for surgery within period of time from the referral to surgery.
Results: Sixty six percent of patients had type 2 DM and remaining 34% had type 1 DM. Median age was 68 (range 37-90), with M:F ratio 2:1.Patients who underwent operations were scheduled for Day Surgery in 53 %, major operation in 38% and urgent 2-week cancer referrals in 9%.
Waiting time for the operation was in 36 cases longer then 6 months. Thirty one patients waited for the operation less then 6 months. In nine cases waiting time was 2 weeks. Most common registered complications related to DM were hypertension (66%), retinopathy (24%), ischaemic heart disease (24%), nephropathy (15%), peripheral vascular disease (11%) and neuropathy (4%).
Forty-nine patients had Hb1AC performed within time from the referral to surgery as a part of the routine review of DM in the practice. Among them 33 had Hb1AC<8% and in 16 cases Hb1AC was >8%. Thirty three patients had Hb1AC performed before the date of the referral and in 8 cases there was no record of Hb1AC at all.
Other investigations if performed were done as part of routine review of DM in following number of cases: eGFR 31%, U&E 53%, Creatinine 59%, Liver Function Tests 53%, Blood Pressure 58%, random blood glucose 7%, LDL 11%, TC 50%, HDL 12%, TC/HDL 7%.
There was one telephone review and extra appointment was given in 11 cases and 7 of those patients had Hb1AC> 8%.
Conclusions: Pre operative management of patients with DM in the selected GP surgery appears to be inadequate, which can potentially lead to increase in post-operative complications.
In a view of this, we are working currently to develop a system where such patients would be highlighted at the time of surgical referral so that the practice could address diabetes control and complications whilst the referral passes through the surgeon.
This will require a new way of multidisciplinary teamwork involving primary and secondary care.

No conflict of interest

P-1672

Report on the International Workshop on Integrated Treatment for Lymphatic Filarias, Leprosy and Diabetes

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In June 2008, three American certified pedorthists – Mary Jo Geyer, Ray Burdett and Dennis Janisse – traveled to Bamako, Mali (West Africa) to present a week-long workshop for healthcare workers from 13 countries who treat patients with diabetes, leprosy and lymphatic filariasis (LF). The goal was to increase and enhance the treatment that these healthcare workers are able to provide to their patients with diabetes, LF, and leprosy.
The program was part of an initiative by the World Health Organization to promote integration in the treatment of diseases by healthcare workers in developing countries. Diabetes is an emerging epidemic in many developing countries and few are well-prepared to deal with the complications of diabetes. LF is a leading cause of permanent disability and therefore, a major obstacle on the road to socioeconomic development. While leprosy is no longer highly prevalent - even in developing countries - it is estimated that between one and two million people are permanently disabled from past or present leprosy. Like diabetes, the peripheral neuropathy associated with leprosy causes severe foot complications and must be addressed in a similar manner.
The faculty was presented with the challenge of designing a universal sandal that could be fabricated with local materials, using simple tools and with minimal training. The design also had to be very low cost, durable, and adaptable to a variety of therapeutic interventions. Participants in the course were asked to bring shoe-making materials with them that were native to their areas or readily available to them. To complicate matters, the fabrication had to be taught in such a way as to transcend multicultural language barriers. Lectures, as well as practical workshops, were used throughout to ensure that after the program participants could return to their native countries and establish and monitor footwear programs.
As health care professionals in westernized countries, we are constantly concerned with insurance, reimbursement and other financial issues. While these issues are important to our everyday practices, it is important to remember that there are innumerable people in our vast world who need pedorthic and orthotic services who do not even know what money is; much less health insurance. These people need help just the same.

No conflict of interest

P-1673

The important role of the health care provider during a human factors trial when developing a new remote monitoring device for Self- Management of Diabetes

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Background and aims: The world of technology in healthcare provides patients and their healthcare providers (HCPs) new cost-effective methods of managing diabetes A wireless monitoring device was developed to allow patients to automatically transmit their blood glucose (BG) data and other important diabetes healthcare related information to a secure web site utilizing Bluetooth technology. On the website, data is displayed in several simple graphs for patient review. A study was developed to demonstrate that the system was simple to use, easy to understand and provided value to the end users.

Materials and methods: A prospective human factors study was conducted at two specialty endocrinology clinics. A total of (15) participants diagnosed Diabetes were recruited along with (6) HCPs. Each patient participant was provided with a blood glucose meter, a wireless device, cell phone and an account to the secure website. Participants followed their physician's prescribed BG testing schedule during the 7-day study period. Participants, for a total of 3 visits uploaded their BG information and health related data to the secure website. The participants could then view BG in relation to their meals, insulin and activity, as well as have access to a large library of Diabetes health related articles. Patients had the ability to personalize their website by setting personal goals. The participant and HCP had opportunity to review information together. At the end of the 7 days (±3) participants and HCPs completed a comprehension questionnaire, human factors testing ability of the system and a satisfaction survey.
Results: HCPs rated the system as being beneficial and effective in management of patients. Importantly, 100% of the HCPs rated the system as one that could help them to provide effective care by improving communication to their patients. HCPs noted tools that were helpful were a library of educational articles that could be assigned, and seeing BG readings in relation to meals, insulin and activity. 100% of study participants who completed all 3 visits thought the system would improve their diabetes care and communication with their HCPs. Among patient participants, ease of use was demonstrated by all patients being able to use the mobile phone application, personalization of the website during first use, and familiarity of site navigation. An ease of use score was reported by patients as a minimum of 92.8% and a maximum of 100%.

Conflict of interest:
Employee: Cheryl Pegus is Chief Medical Officer of SymCare Personalized Health Solutions

P-1674

A multidisciplinary approach to increase access to primary, community-based diabetes care in low-resource settings

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Introduction: Multidisciplinary, patient-centered diabetes care has been proven successful in encouraging diabetes self-management resulting in improved quality of life. This approach has mostly been possible in high-resource settings. In developing countries, team approach is not only hindered by the lack of manpower and limited technical capability. Challenges also include physical and financial access to medicines and biochemical analysis, community responsiveness and governmental support. The participation of other sectors of society is necessary to answer to needs that are beyond the scope of health care professionals – an alternative approach known as multidisciplinary Primary Health Care (PHC). Handicap International (HI) in its pilot Diabetes Project in the Philippines is working with communities to make essential health care accessible by adhering to PHC's three pillars: participation, intersectoral collaboration and equity.
Aim: To increase access to essential diabetes care in low-resource settings by capacity building of various community stakeholders as members of an interdisciplinary, integrated diabetes management team at the primary care level.
Methods: Major stakeholders were organized to form the Diabetes Task Force, the extended diabetes management team emphasizing the importance of each partner's active involvement. Vital partners are the local government unit, primary health care team (health care professionals and community health workers) and persons with diabetes. The subsequent needs assessment led to the formulation of the community action plan where each stakeholder identified their roles and responsibilities. HI provided technical and logistics support to allow each stakeholder to carry out their part. Parallel to these activities simple, culturally appropriate tools including IEC materials, algorithms, registries, forms, and a referral and monitoring system were developed to provide continuous care, feedback and evaluation.
Results: Within two years of project implementation essential diabetes care including affordable medicines, diabetes screening and management are available in seven out of ten pilot communities.
Conclusions: Involving other sectors in the diabetes management team is an effective opening approach for HI's Diabetes Project. The resulting sense of ownership and responsibility is the foundation for a community managed diabetes project. With essential diabetes care in place, stakeholders can now focus on sustainability, quality, and access to psychosocial support. Communities can then be on their way to self reliance.

No conflict of interest

P-1675

Patients without service; establishing a new multidisciplinary diabetic foot clinic in Sharki, Egypt (prevention and management)

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Introduction: In order to detect the foot problems and subsequent complications, a multidisciplinary service is introduced in Zagazig Uni. hospitals, with a team working together in a dedicated diabetic foot clinic.
Steps: The goals of this clinic are divided into direct and remote.
Goals: Direct goals were screening of foot problems, prevention and management of pre-ulcerative, ulcerative, complicated states. This service is under IWGDF guidelines. Regarding the remote goals the clinic tried to achieve better glycaemic control, survey of other diabetic complication, strict follow up and education of patients, staff and assistant personnel training and continuous education. Those needs emerged from the fact that there was no diabetic foot service in our local community.
Epidemiology and importance: The new foot clinic is implemented inside a population of about 5.3 m. citizens in a highly condensed rural (52%) governorate called Sharkia. The diabetes is a major, emerging clinical and public health problem in Egypt. Diabetes (diagnosed and undiagnosed) affects about 9.3% of Egyptian population. Our centre will potentially serve an underprivileged locality with surrounding 6 neighbouring governorates with no foot clinics. In other words 2 known centres of diabetic foot is known all over our country: Mansoura and Alexandria.
Method: Zagazig multidisciplinary diabetic foot clinic is established in a medical facility in Zagazig university (Outpatient clinics of internal medicine department, diabetes & endocrinology unit).
Domestic approach: studying the clinic outcome in the first 100 days is designed as follows: Design; admission, registration, health education, (vascular, diabetes, rehabilitation) consultation, podiatry service, dietary education, offloading and orthotists. Individual files for each patient contain his referral to the pathway data, follow-up and discharge summary, with digital pictures evidence.
International approach: The clinic project was accepted in the first round of IDF-BRIDGES GRANT and team leader attended their workshop proposing our project "Diabetic foot clinic in Zagazig University hospitals, Sharkia, Egypt". Moreover, a team member is now spending two years grant in multidisciplinary diabetic foot ulcer clinic in Lancashire teaching hospitals, UK.
Results: Mean age of diabetic patients with foot problems are 55.8 +/- 9.8 years, while the duration of diabetes was 13.1 +/- 7.8 years. Regarding diabetic foot problem, 24 among 199 diabetic patients have active foot disease (12.06%), two patients with chronic Charcot`s neuroarthropathy, notably among them 17 female (70.8%). 13 patients have hypertension (54.1%), there were no records regarding hyperlipidemia, eye screening, regular feet check, 3 patients with previous minor amputations and one patient with major amputations. Unconfirmed cases with OM were about 4 (16.6%).

No conflict of interest

P-1676

International collaboration in Guyana to reduce amputations in persons with diabetes

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Aim: This project created an interprofessional, patient-centered clinic in Guyana, South America to prevent and treat diabetic foot ulcers and reduce amputations.
Methods: A multi-faceted, longitudinal, evidence-informed educational intervention, was linked to professional practice change and improved patient outcomes. The educational program was designed to:

1. apply effective primary and secondary educational strategies to translate knowledge into practice,
2. adapt the highly rated evidence-based guidelines from the Registered Nurses Association of Ontario and the Best Practice recommendations of the Canadian Association of Wound Care in a resource-poor setting and
3. identify and empower key opinion leaders with a collaborative practice model.

Results: The interprofessional Diabetic Foot Centre was opened at the Georgetown Public Hospital Corporation in July 2008. Four teams of doctors, nurses and rehabilitation specialists were trained and mentored by an expert Canadian team modeling interprofessional collaboration. Thirty participants were taught in two training visits (20 trainees attended both). Trainees rotated through the clinic, working with context-specific enablers that acted as quick reference guides to translate new knowledge into practice. The new knowledge was reinforced with practice reflection through daily seminars. To empower four key opinion leaders with a greater theoretical framework for education methodology, wound care practices and health care systems, they and the project coordinator were enrolled in the International Interprofessional Wound Care Course from the University of Toronto. This course consists of two 4 day residential weekends of interprofessional education separated by 8 months of self study modules and a selective that relates course material to day to day practice.

Discussion/conclusions: Diabetic foot ulcers are a major and growing public health problem in Guyana and elsewhere. They represent the single largest (30%) reason for admission to the surgical wards. The development of sustainable local capacity in low-income countries requires more than one time training sessions. This international collaboration developed local capacity by modeling and adapting Best Practices using primary and secondary (enabling and reinforcing) educational strategies in a longitudinal format with key opinion leader training. This multiple intervention model has facilitated interprofessional collaboration along with knowledge, skills and attitude change to improve diabetic foot care patient outcomes.

Conflict of interest:
Employee: M.G. Rambaran, Georgetown Public Hospital Corporation

P-1677

Comparing the performance of a joint psychiatry/ endocrinology clinic to a community endocrinology clinic for management of weight gain, impaired glucose tolerance and type 2 diabetes in patients with schizophrenia

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In 2001, the Canadian Diabetes Association recognized schizophrenia as a risk factor for the development of type 2 diabetes (DM2). Schizophrenia spectrum disorders are associated with increased rates of impaired glucose tolerance (IGT), DM2, metabolic syndrome and cardiovascular disease. To improve management of weight gain, IGT and DM2 in tertiary care psychiatric patients, we compared a joint psychiatry/endocrinology clinic located in the Royal Ottawa Mental Health Centre to a community based endocrine clinic. Outcome data from these two service delivery models are presented below. There were 16 subjects in each group with a majority of non-smokers. The majority of patients had schizophrenia spectrum illness (14/16 (Royal Ottawa) and 12/16 (Community)) and were Caucasian (15/16 (Royal Ottawa) and 13/16 (Community)). Mean duration of mental illness was 15 years for the Royal Ottawa group and 18 years for the Community group. All individuals were on psychotropic medications. The Royal Ottawa group had stronger family histories of DM2 (25%) and cardiovascular disease (31%). Attendance rates at the Royal Ottawa and Community clinics were 82% and 48% respectively. Attendance rates for the dietician and Healthy Lifestyle group only available at the Royal Ottawa were 90% and 58% respectively. Caloric intake decreased, knowledge scores from the Healthy Lifestyle group improved and psychiatric symptom rating scales remained stable. Over 12 months, the BMI for the Royal Ottawa and Community groups remained at 34 and 41 respectively. Waist circumference at the Royal Ottawa decreased slightly in males and females but remained over 100 cm. For the Community group, waist circumference increased in males and decreased in females but remained over 100 cm. In the Royal Ottawa group, no patients progressed to IGT or DM2 and 2/4 with IGT normalized. In the Community group, there was no progression to DM2, 1 progression to IGT and 4/4 with IGT normalized. Despite trends toward improvement, triglycerides remained elevated and HDL low. There was no change in blood pressure. In conclusion, patients in the Royal Ottawa group were more likely to attend clinic and receive more comprehensive care than the Community group. Healthy lifestyle knowledge and food choices improved. However, metabolic syndrome risk factors remained unchanged or minimally changed in both groups. Aggressive pharmacological management of elevated glucose and lipids should be started together with comprehensive on-site lifestyle changes at initial diagnosis in this high-risk group of patients.

No conflict of interest

P-1678

Building connections: the Maestro Project. The evolution of a systems navigator model for transition from pediatric to adult care for young adults with type 1 diabetes

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Building connections: The Maestro Project uses a systems navigator model to maintain contact with young adults with type 1 diabetes, age 18-25 years, after transfer to adult diabetes services in Manitoba, Canada. The objective of this quality improvement project is to increase their rate of medical and educational follow-up and thus reduce morbidity and mortality from complications of diabetes.

A central database was initiated in 2002 for two cohorts of participants in the Maestro Project: 1) those referred to the program at age 18 years directly after graduation from the regional pediatric program (younger group, n=84) and 2) those age 19-25 years who had graduated from pediatric care prior to the start of the program (older group, n=164). Evaluation was completed Sept-Dec 2004. The feasibility and responsiveness to the program for this age group as well as medical outcomes and effectiveness in improving surveillance has been published (Diabetes 2008; 57 (1):A495). In the first 2 years of the project there was significant improvement in medical surveillance, but no evidence of improved short term medical outcomes for young adults. This may be due to specific characteristics of the young adult cohort, specific characteristics of service delivery in the adult care system, inadequate project development or insufficient time of observation for this model.

As of February 2009, 791 young adults were enrolled in the project. 229 were >25 yrs of age (63 not participating, 166 still participating). 462 were between the ages of 16-25 yrs and 93.5% (432/462) participating. There have been 406 referrals made to connect 183 young adults with services (27.3% Endocrinologist, 49.2% Diabetes Education, 11.3% Family Physician, 8.6% Optometrist, 3.4% Advocacy).

This project has been successful in receiving program status and permanent funding through the Winnipeg Regional Health Authority and has served as the catalyst for implementing a young adult specific evening clinic with dedicated medical and educator staff in a community diabetes center. The systems navigator model is a successful stimulus for systems change, for improving services and for reducing rates of those lost to medical follow up within the first few years of transfer.

No conflict of interest

P-1679

Highlighting multidisciplinary team work in the area of diabetes management

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The Kelsey Trail Health Region is located in North Eastern Saskatchewan; it covers 47,400 km and has a population of 43,204 people. The Diabetes & Heart Health Centre (DHHC) within the Kelsey Trail Health Region provides assistance to people managing health conditions including diabetes, heart disease, weight management, cholesterol problems, and any other nutrition-related concerns. The DHHC teams consist of nurses, dietitians, and an exercise therapist as well as support from other health professionals as much as possible. There are three primary bases for the DHHC teams (Nipawin, Tisdale, and Melfort) as well as satellite clinics in a number of surrounding communities.

The objective of the Diabetes and Heart Health centre is to provide clients with opportunities for secondary prevention through a client centered multidisciplinary approach. Specific programming includes self-management skills, promotion of exercise, nutrition counseling and lifestyle support.
We will highlight examples of effective teamwork, locally and provincially, which enhances the diabetes care for the clients and families we work with.
Examples of this team work include:

- Foot assessment clinics with diabetes nurse and home care nurses team. The team visit involves assessment of sensation and circulation plus it provides a perfect opportunity to engage clients in learning how to best care for their feet. Referrals and follow-up is directed based on client specific needs.
- Local community pharmacies have partnered with the DHHC educators to provide on site consultations with clients. Often the location is more accessible for clients and it provides a different venue for collaboration and client-centered care.
- Teaming up for Diabetes clinics involving the physician, dietitian, diabetes nurse, and exercise therapist. Four clients are invited to attend a morning session involving a conversation map discussion, goal setting and then fifteen minute visits with each health care provider. Clients get to re-energize while experiencing teamwork at its best!
- Acute Care/Diabetes team collaboration in policy development and inpatient client education
- Health Clinic collaboration/ nurse practitioner and diabetes team
- Provincial diabetes resources developed
- Best practice in hypertension treatment
- Glucose meter clinics provide the opportunity for clients to have their blood glucose meters checked for accuracy against the lab standard.
- The Nipawin team travels to the northern community of Cumberland House every two weeks to offer services locally. Optimal diabetes care involves the cooperation of the diabetes nurse, the dietitian, local nurse practitioner, clinic nurses, physicians, support staff, pharmacists, and many key community members.
- Supervised walking program in two communites

No conflict of interest

P-1680

Exploring the educational needs of health care workers in primary health care services and the challenges they face in implementing evidence-based diabetes health care

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Background: A large number of people with diabetes are elderly who receive treatment and follow-up care from primary health care services. Good quality health care is important for metabolic control, ensuring quality of life and for slowing or preventing the development of diabetes-related complications. In order to provide good quality health care there is a need to improve the organization of health care services, and to enhance collaboration within and between primary and specialist health care services.
Aim: The aim of this project was to explore the educational needs of health care workers in primary health care services and to describe the challenges they face in implementing evidence-based diabetes health care.
Sample and method: Focus group interviews were conducted among 16 primary health care workers (12 nurses and 4 nurses aids) age 32-59 years in a primary health care setting that includes nursing homes (n= 10) and a district nursing service (n=6).
Results: Preliminary findings show that the participants experience a lack of knowledge concerning diabetes and of evidence-based standards and guidelines for diabetes treatment and follow-up care. Further, the findings show that the participants often feel alone in their follow-up care of persons with diabetes, and that they lack the professional support of those with expertise in diabetes treatment and care.
Conclusion: There appears to be a need to develop a model that enhances the competence of diabetes health care workers in primary health care and facilitates systematic support in the clinical setting.

No conflict of interest

P-1681

The model of care and unique service delivery for black women and women of colour living with diabetes from African, Caribbean, Latin American and South Asian communities in Greater Toronto Area, Canada

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Women's Health in Women's Hands Community Health Centre's Diabetes Education Program will present the model of care for diabetes care and support for women of colour from the African, Caribbean, Latin American and South Asian communities in Toronto, Canada. This initiative was realized from the recognition that black women and women of colour from these communities are believed to be at higher risk of developing diabetes and it is imperative that health services delivery be culturally sensitive and competent to the community. The presentation will explore how the program and model of care has impacted the overall health and quality of life of women who are marginalized and are of low socioeconomic status living in the urban and rural Greater Toronto Area. Women's Health in Women's Hands Community Health Centre is a feminist, pro-choice, anti-racist and multilingual health centre for women. The centre is committed to working with women from diverse backgrounds, particularly immigrant and refugee black women and women of colour, young women, women with (dis)abilities and women over the age of 16 from the above-mentioned communities. The service delivery of diabetes care and support is framed within an anti-oppression framework, which recognizes the multiple intersecting dimensions of oppression women face in Canada. We will expand discussion of this topic during the presentation. Our goal is to disseminate knowledge on our model of care within this framework for women living with Diabetes and also women at risk for developing Diabetes.
Briefly, the program is designed to create a safe inclusive environment where women who have developed or at risk of developing diabetes can be supported and encouraged to make their health a priority. The program provides a culturally appropriate health promotion and prevention services given the diaspora of client population living in Canada. The presentation will also explore five areas of specialization regarding education and awareness around a diabetes diagnosis. The areas are resource development, prevention education and outreach care and support of women with diabetes, training and skills development and partnership advocacy activities.
The program is structured to encourage women to self-manage diabetes, address existing stigma around living with diabetes and empower women to take charge of their health care with the knowledge of the most current evidence in regards to diabetes self-care.

No conflict of interest

P-1682

Medication discussion and consultation participation between nurse prescribers and people with diabetes in the UK

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Background: In the UK, there are now over 15,000 nurse independent prescribers with virtually the same prescribing rights as doctors. Prescribing nurses therefore represent an increasingly common model of care delivery for people with diabetes. Medication adherence often falls short of what is required for effective symptom control ad optimum long tem health outcomes. Recent national guidance on medicines adherence recommends improving communication, increasing patient involvement, understanding the patient's perspective and providing information (NICE 2009). Nurse prescribers have an important opportunity to improve patient medicine-taking behaviour through their consultations with patients. However, little is known about the characteristics of their medication discussions with diabetes patients in practice.
Aim: This paper will provide an analysis of the frequency, nature and extent of medication discussions between nurse prescribers and people with diabetes in the UK. The findings are taken from a larger study evaluating the impact of an educational intervention for nurse prescribers, funded by Diabetes UK (Latter, Sibley et al, in progress).

Methods: A cross-sectional sample of 59 consultations from 20 nurse prescribers were analysed using MEDICODE (Richard & Lussier 2006), a validated tool for assessing medication discussion. MEDICODE enables assessment of (a) the nature and extent of health professionals' communication across up to 40 medication discussion topics, and (b) levels of consultation participation using two measures: Preponderance of Initiative and Dialogue Ratio.
Results: A mean of 4.4 medications per consultation were discussed, with 6.46 themes per medication. Across all themes, frequently raised discussion themes included: issues of medication usage (68.4% of the time) and dosage instructions (51.1%). Rarely raised discussed themes included: reasons for the medication (8.7%) and concerns about the medication (3.1%). Common concerns discussed included fear of dependency and concerns about starting insulin. Across all themes, the preponderance of initiative was skewed towards the nurse prescriber, and consultations were largely conducted as a dialogue – as opposed to nurse and patient conversing in monologues. These participation indices applied at the individual medication theme level showed a similar overall pattern.
Discussion/conclusion: The extent of nurse prescribers' medication discussion is limited, and comparable to that of doctors. Some important medication themes predictive of adherence were infrequently discussed. However, the dialogic pattern, and the preponderance of initiative findings are more consistent with national recommendations on best practice for medication adherence.

No conflict of interest

P-1683

Care of diabetes foot ulcers

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Background: If an amputation is performed every 30 seconds for diabetes related causes when it is proven that 85% of the amputation is preventable, then there is an urgent need for strategies to salvage many more limbs left. In rural Cameroon, survey was done at the local DIPROLOCC clinic, finding out the efficiency of various wound products and availability.
Method: Each of the ulcerated cases, especially the diabetics ulcers were closely followed since January 2008, wound sizes measured routinely with measuring tape, normal saline used for thorough cleansing and liquid honey (unprocessed) applied generously and then applying gauze.
Results: The locally produced honey by wild bees with the scientific name Apis mellifera was found to be more tolerable, rapid in healing, and affordable as is product of the indigenes, cheap and magical in nature of healing.Many ulcers ranging from venous, tropical, diabetics as well as burns were greatly relieved and cured with pure honey.
Conclusion: Though more effort to understand detailed mechanism of action of honey on ulcers, and its chemical composition, the safety of the product has not been guaranteed and mechanism of action not yet fully understood as well as the safety on diabetes ulcers, coupled with the fact that most people here are poor and medical supplies are very expensive, frequently out of stock; it is seemingly clear that, many ailments from ulcers especially diabetes ulcers, will be relieved and many limbs possibly salvaged with the product.

No conflict of interest

P-1684

Diabetes Low Vision Support Clinic

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With an increase in the incidence of diabetes, the associated complications are becoming all the more common.
The more obvious complications, such as obesity, diabetic neuropathy, heart disease, diabetic nephropathy and retinopathy, are all more screened for on an annual basis.
Some areas have proved difficult for people with diabetes and the associated visual problems to continue with self management. Therefore the Low Vision Clinic has been set up to address the specific needs for these people. It was established as a tool to promote independence and self management for patients with visual problems of varying degrees.
The clinic is jointly run by an orthoptist and a diabetes specialist nurse, to review the patients current equipement to administer medication, monitor blood glucose levels, and the optical aides that they use.
The clinic was initially set up in 2002, at Heartlands Hospital, but the demand and success of the clinic has led to the service being expanded to now being held at Solihull Hospital as well. This denotes a 100% increase in consultations across the two sites.
The clinic has established links with outside agencies, such as Birmingham Focus, R.N.I.B and R.N.I.D.
All new patients referred into the clinic have a full 1 hour assessment, followed by 1/2 hour reviews 3-6 months later. They are then reviewed on an annual basis, or can call for an urgent review if required. All patients are given direct emergency access to the service should they have any urgent concerns.
The clinic adopts a multi-disciplinary approch, empowering the patients to stay independent and motivated.

No conflict of interest

P-1685

Health economics and social engineering in diabetes care – an Indian experience

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Introduction: The current health care scenario in India is compounded by increasing incidences of infectious, nutritional and lifestyle related disorders along with low health insurance penetration (about 2 %) as well as absence of 'out of hospital' insurance. India has the world's largest diabetic population with over 32 million people affected. This is expected to more than double by 2025.
Objectives: To implement a financially self-sustaining, affordable, comprehensive, integrated and continued preventive health and medical care project to address the gigantic Indian public health problem of diabetes and related disorders (ie. co morbidities – hypertension, dyslipidemia, cardiovascular diseases etc).
Methods: In 2003 "JNANA SANJEEVINI" project was started with an initial investment of 200,000 $, from Samatvam Trust (non-profit charity organisation). This was to provide "health care of highest possible quality to highest possible quantity".
The cost cross-subsidy service delivery model adopted is as below:

Services	Charity	Low	Middle	Upper
Health education	free	free	market	premium
Consultations	free	highly subsidised	market	premium
Diagnostics	free	subsidised	market	market
Medicines	free	subsidised	market	market

Consultations include endocrinologists, ophthalmologist, surgeons, gynecologists, etc.
Diagnostics includes T.M.T, X-ray, pathology, biochemistry, etc.
Revenue Generation is as follows:
1. Above 90% from patients constituting about 75% of the total patients served.
2. Less than 10% from public charity.

The revenue generated from the upper 2 socioeconomic classes helps to support and cross subsidize the expenses related to the lower classes, thus fostering the financial viability of the project.
Results: Since 2003 Jnana sanjeevani has served nearly 12,000 patients with Diabetes, 25% being charity patients. The project has attained financial sustainability in its 5th year of operations and is currently striving to grow in terms of its reach / patients serviced.
Conclusion: Cost cross-subsidy is a financially viable model of service delivery that can be adopted in societies with a mixed socio-economic status.

No conflict of interest

P-1686

Diabetes care centre: providing an innovative and comprehensive care approach for diabetes patients in Mauritius

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Aims: The 'Association pour la Promotion de la Santé' is Mauritian based NGO, involved in diabetes prevention and education since 1994. Concerned with the alarming prevalence of diabetes in Mauritius, the association decided to

build the first Diabetes Care Centre in the Indian Ocean. The centre will be established as a model in comprehensive care for the patient with diabetes. This holistic, multi-specialist centre will provide a unified team approach to the management of diabetes: diabetes specialists and educators, dieticians, podiatrists, clinical psychologists, and bio exercise therapists will work together around each patient. Healthcare professionals will be trained in order to provide a coordinated standard of care. A fully equipped gym as well as a health bar and shop will be available. The centre will be operational as from December 2009.

Methods: The building has been specifically designed to allow the patient to have easy access to various consultation and medical facilities. A minimum care protocol will be provided including a minimum of 2 annual visits with the doctor, the diabetes nurse educator, and the health educators, and one annual visit with the nutritionist, the podiatrist and the ophthalmologist, and only when required, with the exercise therapist and the clinical psychologist. Laboratory tests such as HbA1c, Lipogram, FBC, U&E and Microalbuminuria will also be performed to monitor diabetes and patient's results. This protocol will be known as the Diabetes Management Programme and will be implemented to effectively improve glycaemic control, reduce hospitalization and progression of both micro vascular and macro vascular diseases. All patient databases will be monitored and patients' progress will be collected and entered in a database on a daily basis to assess and report outcomes. In this way real-time information on all patients will be available for analysis at any time through a centralised web database.

Results: In the first year 500 to 1,000 people will be included in the Diabetes Management Programme. This number will increase to 2,000 in the second year and more in subsequent years. By reducing the patients modifiable risk factors and HbA1c, the Diabetes Management Programme aims to reduce diabetes related deaths by 42 to 63%, Fatal and non-fatal MI by 28 to 42%, Fatal and non-fatal Stroke by 24 to 36%, Cataract extraction by 38 to 57%, Heart Failure by 32 to 48%, Micro vascular endpoints by 60 to 90% and amputation or death due to PVD by 86 to 95%.

Discussion: The expected results bring a discussion about the necessity of implementing a diabetes clinic in Mauritius that will provide a patient centred care in one location. This approach will enable the patient to be closely monitored and therefore reduce diabetes related hospitalization.

No conflict of interest

P-1687

Views on the involvement of pharmacy service in screening for diabetes and hypertension: the collaboration between community pharmacies and National Health Insurance, Thailand

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The general coverage of screening for diabetes and hypertension was still below target. The role of community pharmacy in prevention and promotion activities is developing to do screening for diabetes and hypertension with the National Health Insurance as an alternative outlet for people to access. Although a few areas have started the collaboration between community pharmacies and the government primary care units, the level of involvement of community pharmacy in local health insurance overall is still limited.

Objectives: To learn more about the opinions from health policy makers, health care providers and customers who are involved in the screening project for high risk population for diabetes and hypertension by community pharmacies with the collaboration of primary care units in Maha Sarakham Province.

Methods: In-depth interview using open questions was conducted in six local policy makers, nine health care providers and nine customers who had experience with community pharmacy service. The participants were asked about their opinion, attitudes, expectations and barriers towards the screening program by community pharmacy. Thematic analysis of the audio-taped transcripts was conducted.

Results: The findings revealed three themes towards the collaborative screening project: (1) perception of the contribution of the screening project, (2) the desired role of collaborative development, (3) barriers. The results showed that policy makers, health care providers and customers supported the themes with different contexts.

Conclusions: Participants realized the importance of working together as a network in local area to do screening for diabetes and hypertension as part of the national health insurance. It appears that the collaborative screening program is a good model to strengthen Thai health care system that still needs more development.

No conflict of interest

P-1688

An interprofessional diabetes health promotion clinic at an academic urban family health team – an innovative way to improve access to diabetes care

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Aims: Over 1.8 million Canadians have diabetes, and this number is projected to grow due to an aging populations and increased immigration. Specialized diabetes clinics bring together the personnel and resources necessary to meet patient needs.

The goal of the program is to optimize the primary care of patients with diabetes by improving community access to a team of interprofessional practitioners. The program incorporates the training of family MD residents and other professional interns. Another objective is to increase the consistent adherence to clinical guidelines.

Methods: The Interprofessional Diabetes Health Promotion clinic was initiated 2 years ago. Each clinic is a 2-hour process whereby mostly complex, type 2 diabetic patients rotate between a pharmacist, dietitian, nurse, physician, and patient education specialist. Each provider conducts detailed, specialized assessments on the patient. Each clinic concludes with an interprofessional patient-centered discussion. Documented team recommendations for each patient are sent to each patient's primary care physician for appropriate follow-up.

Results: A significant increase in patients prescribed cardiovascular protective medications was reported post-clinic. A significant improvement in TC:HDL was seen in most patients post-clinic.

An average downward trend in blood pressure was seen post-clinic.

Patients reported better understanding of overall diabetes care, and self-efficacy post-clinic. It was reported that 67% of patients had a healthier diet post clinic, and 50% reported an increase in physical activity post clinic.

All of these results plus more will be explored further as more data becomes available.

Discussion/conclusion: The clinic involves care delivered by five team members, and one clinic is equivalent to five patient visits for assessment and counselling with each health care professional. This format is patient centered, improves access to diabetes care, and provides efficient service. A visit to our clinic also replaces a patient's quarterly diabetes appointment with their primary care provider.

Preliminary results show promising trends in both objective and subjective measures. We continue to collect data to evaluate our program.

Our interprofessional clinic serves as primary care model that saves time for both the patients and health practitioners and incorporates medical and healthcare professional training while delivering optimal patient-centred care and improving access to healthcare for the community.

No conflict of interest

P-1689

Diabetes related admissions to the emergency room of a district hospital in South Africa

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Background: The global threat of diabetes is immense. The prevalence of diabetes is increasing and is hitting lower income countries and communities hardest. Africa will not escape the impact of diabetes. Already it is caught in a double burden of infectious diseases and emerging chronic diseases.

Undetected, untreated or poorly controlled diabetes can result in devastating complications.
The author wished to evaluate the reasons for diabetic patients visiting the emergency room of a district hospital in a semi rural area of South Africa. The findings will go a long way to alert the practitioners in this and similar areas about the complications seen in diabetic patients at this underserved emergency room, so that improvement in the management of diabetic patients can be implemented to avoid unnecessary admissions to the hospital.
Method: Data from the emergency room register were retrospectively collected for the period of twelve months, from 01 January 2008 to 31 December 2008 for patients seen with the diagnosis of diabetes or diabetes related complications.
The diagnosis of diabetes or diabetes related complications was based on the findings by the doctor on duty as recorded in the emergency room register.
Other variables included diagnoses not related to diabetes in diabetic patients, or a co-morbidity diagnosed by the treating doctor.
Results: The study found that diabetic patients were admitted to the emergency room for various different reasons with hyperglycemia, cataract, new diagnosis of diabetes, hypoglycemia, diabetic ketoacidosis and hypertension, respectively as the main diagnoses made on admission.
The study also found that type 2 diabetes was the predominant type of diabetes seen in the emergency room and hypertension the most common clinically associated condition in most diabetics.
Conclusions: The survey established that patients suffering from diabetes mellitus do consult the emergency room for diabetes related complications and also for non-diabetes related problems. The diabetes complications constitute the bulk of the diagnoses made by the casualty doctor. These complications might have been prevented if patients were adequately counseled about lifestyle changes and appropriate management instituted by the treating clinicians. Therefore, the author recommends that tight control of diabetes in the patients attending the practices have to be prioritised in all diabetics. Treatment of hypertension in diabetic patients should not be unnecessarily delayed.
Appropriate and up to date management guidelines on treatment of complications of diabetes to be available in the emergency room at all times. The establishment of diabetes clinics in the community is to be encouraged and supported.

No conflict of interest

P-1690

Contribution of nurse's consultation in diabetology - experiment in a French country area

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Introduction: In France, increase of diabetic patients number, requires actualization of strategy in screening and in care for diabetes. As a matter of fact, diabetologists number is more and more insufficient.
Study: The experiment has been lasting since three years in non university hospital, in rural zone, in the French north-east quarter. The followed patients are 2 500. Two doctors are involved in consultation (about 1 000 a year), planned hospitalisations (during five days) for education and actualisation of treatment, diabetology out-patients facilities for annual or bi-annual check up, conventional hospitalisation for cardiovascular complications, mal perforant etc…). Two nurses have been trained. They effect 400 out-patient consultations a year, with an object of therapeutic education. Of course, medical supervision is permanent. The nurse's function is specifically educational; about dietetics and treatment's control (insulinization, oral anti-diabetic drugs) giving glycemia targets and means to reach them. The visit lasts half an hour. The patient comes back every month so long as the target is not reached.
Results: The improvement of HbA1C is 1.5 %.
Conclusion: The investment is middle-term and long-terms. Nurse's contribution makes up partially for shortage of specialists.

No conflict of interest

P-1691

Psychological process and psychometric study of diabetic and non-diabetic men who will undergo penile prosthesis surgery for erectile sexual dysfunction

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Introduction: This study come to the results from the 100 diabetic and non-diabetic men studied since 2006 to 2008 to penile prosthesis surgery by erectile sexual dysfunction, under study national project in Havana Cuba.
This study was as the main objectives of research: to know efficacy, safety, side effects, and satisfaction from men and partner whit the penis prosthesis surgery.
In addition as a different approach this study showed the results from the psychological and psychometrics approach of whole group of patients.
Objectives: To know body representations, anxiety, depression, and the characteristics of psychological process, particularly satisfaction with the surgery results and to know these psychological process involved to own body and partner body.
Methodology: In depth interview to men and a sample of partners, and Psychometric Test like as: Anxiety Test of Catell, MMPI Test of Hathaway y Mac Kinley, Somatic Test –Body Symbolism of Wilfred A. Cassell (Cuban version C.T.García) and Case Study.
Results: 25 % of men were Diabetic person. The majority of them are normal results from the psychometrics test. Nevertheless 40% of them have psychological conflicts with body symbolism particularly with vagina representation. Some of them showed psychological repression and in front the card of the vagina they show answers like that: "this is a butterfly", "it´s an insect", it's a flower", "this is a dark and dangerous place".....In addition a sub-group of wife showed partner conflicts after penis husband surgery and dissatisfaction with this surgery.
Conclusions: Studies from psychological and partner relationship and psychological counselling were very helpful to improve penis prosthesis surgery satisfaction by erectile sexual dysfunction and men and partner well being.

No conflict of interest

Quality assurance in diabetes care

P-1692

Multi-national study examining the association between diabetes therapy and glycaemic control in patients with type 2 diabetes

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Aims: In preparation for an international intervention aimed at improving quality of care using Staged Diabetes Management (SDM), baseline data on current status of diabetes care were collected in a sample of patients with type 2 diabetes in India, China, Brazil, Mexico and Russia. The aim of this study was to determine in this sample whether treatment modality was associated with metabolic outcome.
Methods: Prior to the training in SDM (a systematic, evidence-based approach incorporating national diabetes guidelines and local resources), each participating physician collected baseline data on approximately 20 patients with either type 1 or type 2 diabetes randomly selected from their practice using a standardized data collection tool. Data were entered into an electronic database for analysis.
Results: 323 physicians (India 157, Brazil 71, Mexico 59, China 25, Russia 11) were included in the analysis. After removing duplicates and erroneous data, and limiting the analysis to only adult patients with type 2 diabetes, there were 2920 (63%) evaluable cases (India 1377, Brazil 509, Mexico 542, China 292, Russia 200). Mean age was 55±19 years (55% male) with diabetes duration 10±8 years. Diabetes therapies were divided accordingly: 11% insulin alone, 36% insulin with oral agents (OA), 33% combination OA, 16% OA monotherapy (half of whom were treated with metformin) and 4% treated by diet alone. There was a significant ($R=0.24, p<0.0001$) relationship between treatment type and glycemic control when data from the countries were pooled. Patients treated by insulin alone had the highest HbA1c (8.7±1.9%).

Patients using metformin in combination with TZD (n=52) or metformin alone (n=257) had the lowest HbA1c (7.28±1.1%, 7.5±1.5% respectively). Separate analysis showed that in all countries with the exception of Russia (p=0.18), treatment was correlated with metabolic outcome. In China the relationship between HbA1c and treatment was strongest (R=0.36, p<0.0001). Patients treated with insulin alone averaged 9.3% HbA1c, while those treated with metformin alone averaged 6.7% HbA1c.

Conclusions: This data can be utilized to understand the relationship between treatment and clinical outcomes in order to target interventions towards improving glycemic control in countries with high prevalence of diabetes. Because SDM systematically advances therapies and maximizes insulin-based strategies it can be employed to ameliorate glucose control in a rapid and safe fashion.

No conflict of interest

P-1693

Comparative effectiveness of high quality versus usual diabetes care

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Aims: To compare the effectiveness and quality of diabetes care delivered through a comprehensive program including all the components of quality of care (structure, process, performance and outcomes), versus usual diabetes care delivered by a tertiary care hospital in Mexico.

Methods: A case-control study was made to compare demographic data, clinical characteristics, and clinical outcomes in patients treated at Diabetes Center in Pachuca, a research and development institution devoted to improve the quality of diabetes and chronic disease care, with results recently published from a diabetes clinic in a tertiary care hospital in Mexico city. By comparison to usual diabetes care, with long waiting times, rotation of doctors and brief visits with a vertical, doctor-centered and prescriptive approach, Diabetes Center in Pachuca has introduced improvements in the delivery of patient-centered and evidence-based healthcare to increase patient adherence, reduce clinical inertia, and enforcement of a multidisciplinary approach. Diabetes self-care education is an essential component of the program, with goals of treatment clearly explained and negotiated with patients.

Results: General characteristics and outcomes of patients with Type 2 Diabetes receiving usual care (CUC) by specialists, or structured diabetes care (SDC) by multidisciplinary groups of primary care providers are shown in the following table:

Variable	CUC	SDC
Number of patients	468	428
Mean A1c	10.2%	7.77%
Patients with A1c <7.0%	12.9%	44.4%
Patients with blood pressure <140/80 mm Hg	82.2%	67.4%
Patients with LDL cholesterol <100 mg/dl	45.1%	55.3%
Patients with Triglycerides <150 mg/dl	75.8%	40.9%

Conclusions: The results of this analysis shows that structured diabetes care delivered by multidisciplinary teams of primary care providers achieves better glycemic control than usual non structured care delivered by specialists. Factors to consider are organizational arrangements to reduce waiting times, rotation of doctors, adequate time for baseline and follow-up examinations, a patient-centered approach and prompt delivery of self care diabetes education. By comparison, control of cardiovascular risk factors, including blood pressure and triglycerides is superior in patients treated at a tertiary care facility. Taking into account that most of the patients with diabetes receive lifetime treatment from general practitioners, the results of this analysis reinforce observations from structured primary diabetes care programs published in developed countries.

No conflict of interest

P-1694

Consumers drive collaboration with health professionals, academia and industry to inform quality improvement through the development of A Statement of Issues affecting Australians with Type 1 Diabetes

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Background: Type 1 Diabetes represents 15% of diabetes in Australia yet 42% of the cost. Evidence-based clinical targets, essential monitoring and management of risk factors are achieved by less than 20% of Australians with Type 1 Diabetes, and health outcomes remain poor[1]. Government policy and service delivery have focused on Type 2 Diabetes, and Type 1 Diabetes has fallen behind in priority and action.

The Type 1 Diabetes Network, a consumer organisation, formed the Type 1 Diabetes Opinion Leaders Group in 2008 with health professional bodies, academia and industry represented alongside 15 people affected by Type 1 Diabetes. Private endocrinology, psychology, adolescent services, tertiary hospitals, health promotion and general practice were also represented.

Methods: Online communication tools were used by 33 members of The Type 1 Diabetes Opinion Leaders Group to collaborate over five months through a four-stage process: broad scoping of issues; exploring issues in themes aligned with Wagner's Chronic Care Model; identifying key issues within themes and reviewing a draft statement. 78 public submissions were also received and considered.

Results: Ten key issues were identified and published as A Statement of Issues affecting Australians with Type 1 Diabetes, including:

1. Access to specialist medical advice is very limited, especially in rural and regional areas
2. Complexity of Type 1 Diabetes is neither well understood nor managed
3. Coping with long-term complications is left to the individual with very limited support
4. Hospital admissions, planned and emergency, are managed poorly when a diabetes team is not involved
5. System for the essential long-term monitoring is inefficient and highly ineffective

Over 100 solutions to the issues were also collected and published.

The Statement has been provided to government, peak bodies and health service managers nationally.

Conclusion: The challenge is finding a cost-effective means of supporting people with Type 1 Diabetes to achieve optimal control of blood glucose levels and other risk factors to improve outcomes.

Healthcare quality improvement is informed by economic, clinical and consumer values of quality. Consumer values are generally complex and expensive to ascertain and difficult to align with other values. The Statement, and its resource-efficient method of development, exemplifies an effective method of capturing and contributing consumer values of healthcare quality.

The Statement provides a framework for health policy and planning to support improvement of health outcomes for Australians with Type 1 Diabetes, against which future policy and planning could be evaluated from the patient perspective.

[1] *Gilbert K. Type 1 Diabetes in Australia. 2008 www.d1.org.au/issues*

No conflict of interest

P-1695

A wide difference of quality of diabetes care in the secondary/tertiary healthcare centers in Korea; Korea national diabetes program survey 2008

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Aim: This study investigated the status of diabetes control in secondary/tertiary care centers in which diabetic patients are treated by diabetologists.

Methods: It was conducted at 12 university hospitals (all were collaborative centers for Korea National Diabetes Program) from July to September 2008. Total of 1500 (721 men) type 2 diabetes mellitus (T2DM) patients who had been followed-up for more than 3 months at each center were surveyed. Five patients were consecutively recruited daily among the patients who visited their clinics. Data were collected by reviewing their medical records and conducting interviews.

Results: The mean duration of diabetes was 9.1 ± 7.3 years, and mean age was 58.5 ± 11.3 years. Among them, 75.4% of patients were overweight or obese. The proportion of those with a history of macrovascular complication was 20.3%. By history, patients with diabetic retinopathy was 19%, neuropathy 23.6% and nephropathy 7.0%. But in terms of nephropathy by medical record, microalbuminuria was 12.1%, overt proteinuria 9.6%, and renal insufficiency with GFR less than 60 ml/min was 21.8%. The proportion of patients with diabetic education, test for diabetic complication, and self monitoring of blood glucose was 70%, 85% and 75.5%, respectively. The prevalence of severe hypoglycaemia (within the last one-year period) was 4.5%. Mean HbA1c was 7.5 ± 1.5%, fasting blood glucose 138.8 ± 48.2 mg/dL, and postprandial 2 hour glucose 203.7 ± 91.0 mg/dL. The proportion of good glycemic control (HbA1C <7%, ≤ 6.5%) was 41.7% and 27.1%, respectively. The proportion of poor glycemic control (HbA1c ≥ 8%) was 28.4%. Patients treated with oral antidiabetic drug was 85% and insulin therapy 15%. Patients achieving optimal control of blood pressure (<130/80) and lipid (LDL-cholesterol <100 mg/dL) was 40.9% and 29.6%, respectively. The proportion with antiplatelet therapy was 51.5%. There were significant differences in status of glycemic control, quality of care between participating centers (p=0.000).

Conclusion: This data revealed that even for specially treated type 2 diabetes in secondary/tertiary care center, it was very difficult to achieve optimal glycemic control and risk management for overall type 2 diabetic patients. For the overall improvement of quality of care, constructive national intervention program for optimal diabetes care should be performed.

No conflict of interest

P-1696

Quality of care and outcomes of diabetic foot ulcer patients managed by a diabetes extremity care team at the Philippine General Hospital

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Background: The diabetes extremity care team (DECT), multi-specialty team of the Philippine General Hospital composed of internists, endocrinologist, orthopedic and vascular surgeons, infectious disease specialist and rehabilitation physician, was created to decrease mortality and amputation rates.

Objective: To compare the quality of care and outcomes of patients managed before and after the DECT was established.

Research design and methods: Retrospective study done on all diabetics admitted with foot ulcers managed by the DECT from 2004 to present. There were 550 charts retrieved, however 58 charts were excluded because of missing pages; 492 were eligible for review. Ulcer severity was graded with University of Texas. Demographic data, outcomes and quality of care indicators were expressed as means and percentages. The differences between 2 means were tested for significance by t- test and differences between two proportions by z test.

Outcomes: Using the Structure-Process-Outcome model, the following were analyzed: factors affecting the structure: protocol, response rates; process: adequacy of foot examination and antibiotic use; outcome: mortality and amputation rates.

Results: There was no significant differences in age, 56± 10.7 (versus 55±11 years, pre-DECT, p0.27), duration of diabetes 7±7.2 years (versus 7.4±6.8 years), BMI, 24±6.6 (versus 24±3.6 kg/m^2), without treatment, 82 out of 492 (versus 25 out of 204, p0.14), with neuropathies 371 out of 492 (versus137 out of 204, p0.49). There were more males (308 out of 492 versus102 out of 204, p<0.01), arterial occlusion (146 out of 492 versus 40 out of 204, p<0.01), University of Texas 3D ulcers (318 out of 492 versus 97 out of 204, p<0.01).

Quality of care: Seventy five percent (372 out of 492) were seen on day of admission. All were seen by the internist on the first day followed by orthopedic surgeons (402 out of 492). Number of patients with adequate foot examination was 40% (197 out of 492), with culture guided antibiotic use was 76% (377 out of 492), compliance was poor (258 out of 492 had missed doses of <25%), and mean time antibiotic was started in 9.8±1.4hours (versus.15.1±3.9 pre-DECT).

Outcome: Mortality rates decreased from 13.8% (28 out of 204) to 5.8% (29 out of 492), amputation rates decreased 70% (143 out of 204) to 47% (233 out of 492).

Conclusion: This study shows the effectiveness of a team management. Using the above model, further improvements can still be done at the level of the structure and process.

No conflict of interest

P-1697

Assessing the degree of success for American Diabetes Association clinical goals among diabetic subjects in a teaching hospital setting in Nigeria

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Background: The American Diabetes Association (ADA) published treatment goals for physicians managing patients with diabetes mellitus in an attempt to improve control of diabetes and prevent complications. The success with which physicians are able to meet the clinical goals is unknown in Nigeria.

Objective: The study aim to assess the success with which physicians are able to meet the set ADA clinical goals in Nigeria.

Methods: Hospital records of sub-samples of consecutive patients with type 2 diabetes seen between September 1999 and August 2001 were reviewed to assess the attainment of the six ADA treatment goals and the frequency of receiving the four ADA-recommended health services.

Results: The mean number of ADA goals attained was 4.4 +1.2. No patient had attained all 10 goals. A total of 118 (54.1%) and 123 (56.4%) patients had attained the ADA goals of diabetes daily use of aspirin and HDL level respectively; most patients had attained ADA goals for triglycerides 189 (86.7%), LDL level 168 (77.1%) and diastolic blood pressure control 175 (80.3). Most patients had not received annual eye examination 210 (96.3%) nor attained systolic blood pressure control 133 (61%). Although most of the patients had urinary microalbumin screening as part of another study protocol using the same sample population, routine microalbuminuria screening is not presently done and should be incorporated into the management protocols of our diabetics.

Conclusion: ADA treatment goals may be quite difficult to attain in the developing health care setting. Physicians and patients should make efforts to attain the ADA treatment goals so as to prevent diabetic complications.

Key words:

- Quality assurance in diabetes care
- Guidelines, clinical care

No conflict of interest

P-1698

Self-evaluation of lipid-lowering drug prescriptions in type 2 diabetic patients in a diabetes department

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Aims: Type 2 diabetic (T2D) patients are at high cardiovascular (CV) risk, and multifactorial intervention is needed to reduce hyperglycaemia, hypertension, dyslipidemia [mainly LDL-cholesterol (LDL-C)] and tobacco consumption. To decrease LDL-C level is rather easy, using lipid-lowering (LL) drugs, mainly

statins, in addition to diet, and it provides the most effective prevention for CV diseases. In France, the Health Authorities published in 2007 recommendations concerning the LDL-C objectives in T2D patients with regards to their CV risk. From 2004 the law makes it mandatory for all practitioners to evaluate their own practice, in order to improve patient care. We evaluated how the recommendations concerning lipids were applied in our Diabetes Department by a cross-sectional study.

Methods: From February 2008 to April 2008, 11 diabetologists were asked to include 20 consecutive T2D patients consulting in our Department. They filled in a short questionnaire providing information on the level of CV risk (personal and family history of CV events, CV risk factors, retinopathy, nephropathy, HbA1c and lipid levels), current LL treatment and compliance, then modification of LL treatment if any. Statistical analysis calculated means and percentages, and compared observed and expected LDL-C.

Results: 199 T2D patients were examined, aged 63±12 yrs (m±sd); 54% men; 81% treated by metformin, 54% sulfonyureas, 40% insulin, 18% thiazolidinediones; HbA1c=7.5±1.2%; hypertension in 74%; 10% current smokers; personal history of coronary event in 16%, stroke 5%, nephropathy 27%, laser treatment 10%; LL drugs were used in 68% of patients (statin 64%, fibrate 13%, ezetimibe 8%). Lipid levels within the 3 last months: LDL-C=0.93±0.31g/l, HDL-C=0.50±0.15g/l, triglycerides=1.34±0.79g/l. In secondary prevention and high-risk CV patients, LDL-C=0.83±0.29g/l (objective<1.00g/l) and in T2D patients with a single CV risk factor, LDL-C=0.97±0.32g/l (objective<1.60g/l). Recommendations for LDL-C were fulfilled in 89% cases. Statin had been interrupted in 6% because of side-effects. Compliance was excellent: 3% acknowledged not to take the prescribed LL drug and 4% forgot LL drug once a week. LL treatment was increased in 12% of the patients at the end of consultation.

Discussion/conclusion: Recommendations concerning LDL-C objectives and LL treatment in T2D patients are well applied in our Department. TO practice self-evaluation has probably contributed to improve diabetes care: the two consultants whose patients had the highest LDL-C levels were the two who increased most LL prescription at the consultation. In addition, each consultant having received the statistical analysis of his own data should be able to improve his diabetes care practice for lipid control.

No conflict of interest

P-1699

How does sex differentiate the situation of diabetic patients

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Aim: This study characterizes the situation of patients with diabetes in relation to sex-determined differences.

Materials and methods: The research for this study was carried out among 1986 patients with diabetes and1366 families, originating from the randomly chosen 61 units of the national primary health care. This study was carried out within the scope of SCSR grant no 6P05D02320.

The study used: nurse interviews, assessment of patients' fitness and independence, questionnaires for patients and their families and analysis of medical data.

Results: Co-existence and over-lapping of factors (lack of preparation to self-care, improper results of biochemical tests, excessive body mass, arterial hypertension, additional diseases, addictions, ailments and disturbances of psychosomatic health, difficulties in respecting recommendations, deficiency in social functioning, deficiency in caring efficiency of the family, unfavourable socio-economical situation), which determine high and very high need for care were more frequently found for women (66.4%) then men (33.6%, p=0.00002).

The unfavourable situation of diabetic patients expressed by their expectancies towards care of family nurse (p=0.01576) and a social worker (p=0.03281), are more frequently expressed by women then men.

The analysis of the family situation of the tested person showed that the families of diabetic women are most frequently characterized by a lack of preparation to give support for a patient (63%, p=0.02038), as well as by a deficiency in satisfaction from the results of treatment (67.9%, p=0.03105).

Conclusion: Lack of adjustment of care to the patients' expectations and needs is confirmed by their expectations towards the care of a family nurse and a social worker. The expectations towards the care of a family nurse and a social worker may also result from a feeling of helplessness and lack of competence determined by the lack of preparation, lack of fitness and a difficult socio-economical situation of the patients as well as by the lack of possibility of obtaining help from the family.

The research confirmed existence of inequalities in health and functioning of diabetic patients and the necessity to intensify medical and social care for women. The knowledge of the factors differentiating situation of women in comparison to men allows to adjust the care to the existing needs and counteract the negative consequences of diabetes. The increase of involvement of family nurses and social workers in the care of diabetic patients can be a way to optimize the results of treatment, especially in the population of poor patients and women.

No conflict of interest

P-1700

Insulin glargine and quality of life of type 2 diabetes patients in Bangladesh

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Background: Quality of life is an important health outcome besides achieving the therapeutic target in patients with type 2 diabetes mellitus. The ADA/EASD consensus statement recommends early addition of basal insulin therapy for intensifying treatment to achieve therapeutic targets. Due to fear and concerns about quality of life, both physicians and patients are often reluctant to initiate insulin therapy. Once daily basal insulin glargine has proven better glycaemic control and improved quality of life in several clinical studies. We conducted the survey to observe effects of insulin glargine on quality of life in Bangladesh.

Methods: Type 2 diabetes patients poorly controlled with previous oral anti-diabetic agents and reluctant to insulin therapy, currently on insulin glargine for at least 3 months, completed a questionnaire related to quality of life. The questionnaire was designed for patient satisfaction about knowledge on diabetes, diet, exercise and current treatment.

Results: A total of 50 patients completed the questionnaire. Of them 56% were moderately satisfied, 22% moderately dissatisfied and 10% very dissatisfied with their knowledge on diabetes and its management. To 46% of patients unplanned dietary habit was believed to be a barrier for controlling diabetes. However, 40% expressed dissatisfaction to the changes of usual diet. Regular physical exercise was performed by 30% of patients and 12 % never had exercise as suggested by physicians. To control diabetes, profession was neither considered a barrier to 86% of cases, nor limits the career to 64% of cases. However, 18% of the patients had a worry about missing work due to diabetes. For being a diabetic, 36% of the patients did not usually feel physically ill but 16% had a feeling of not being well most often. A bad night sleep was reported by 30% of the patient because of diabetes. To control blood glucose, 86% of patients were satisfied with current treatment of insulin glargine. Administration of insulin was convenient and flexible to 70% of cases. About 90% of the patients reported that insulin glargine neither interrupted food intake nor was troublesome to daily activities.

Conclusion: Early basal therapy with insulin glargine improves the quality of life in diabetes. To enhance the quality of life in patients, strategies on diabetes education, lifestyle interventions and supports to be adopted as well.

No conflict of interest

P-1701

Risk factor control in patients with known and newly diagnosed type 2 diabetes mellitus

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Aims: The prevalence of type 2 diabetes mellitus is underestimated. In many cases diabetes mellitus is only diagnosed in connection with an acute myocardial infarction. We examined the control of cardiovascular risk factors in high-risk patients.

Methods: In 192 patients with type 2 diabetes mellitus admitted for preliminary invasive diagnostics in conjunction with suspected coronary artery disease, we determined the following classic risk factors: blood pressure, LDL cholesterol, HDL cholesterol, triglyceride, nicotine consumption, body weight and HbA1c. In 130 patients, diabetes 2 was known and treated (A); in 62 (corresponding to 12.3% of the patients examined) diabetes was newly diagnosed (fasting blood sugar, fructosamine, HbA1c, double testing of fasting and 2-hour OGTT levels) (B).

Results: 18% of group A and 15% of group B were of normal weight (overweight: 65% / 61%, obese: 27% / 24%). Nicotine consumption: 12% of group A were smokers, 39% ex-smokers; 25% of group B were smokers, 53% ex-smokers. 62% of group A and 5% of group B received statin medication. Antihypertensive medication in per cent (A / B): ACE 72 / 65, ARB 17 / 31, betablockers 80 / 61, diuretics 63 / 55.
Target values for risk factors: arterial hypertension (AH) < 130/80 mmHg, LDL-C < 100 mg/dl, HDL-C > 45 mg/dl, triglyceride < 150 mg/dl and HbA1c < 6.5%

	A (known diabetes)	B (newly diagnosed diabetes)
	n= total / % controlled	n= total / % controlled
AH	108 / 28	32 / 16
LDL cholesterol	130 / 39	62 / 27
HDL cholesterol	130 / 58	62 / 61
Triglycerides	130 / 44	62 / 42
Hb A1c	130 / 18	62 / 35

Conclusions: In high-risk patients, glucose metabolism should be managed in order to prevent a manifest diabetes mellitus or an impaired glucose tolerance from being overlooked. In high-risk patients with type 2 diabetes mellitus, classic risk factor control is poor.

No conflict of interest

P-1702

To observe the implementation of American Diabetes Association (ADA) guidelines for care of type 2 diabetics at Peripheral Diabetes Clinics in Karachi, Pakistan

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Objective: To observe the implementation of American Diabetes Association (ADA) guidelines for care of type 2 diabetics at Peripheral Diabetes Clinics (PDCs) in Karachi, Pakistan.
Research design and methods: The study was performed using a retrospective medical chart review of 691 type 2 diabetic patients 20 years of age and older. All of these patients had a definitive diagnosis of type 2 diabetes and records were documented on their first visit. Four peripheral diabetes clinics in four townships of Karachi district which were in operation between 1 Jan 2005 to 29 Dec 2006 were selected.
Results: A total of 691 patients (332 males and 359 females) with type 2 diabetes had a mean age of 50.94 ±10.4 years. Mean BMI was 26.6 ± 4.77 kg/m^2 and 60% of these patients had a positive family history of diabetes. Comorbidities were largely present, 84.6% had hyperlipidemia, 59% were hypertensive, 31.3% had retinopathy, 22.6% had nephropathy and 18.6% had peripheral neuropathy.
On their first visit 86% had their blood pressure measured, 56% patients had serum creatinine measured, 45% had HbA1c measured, 31% patients had dilated eye examinations, and 25% had urine albumin screening. Of these patients, 44% had lower leg examination and 2% patients were suffering from diabetic foot ulcer.
Mean systolic blood pressure (SBP) was 138 ± 19.8 mm Hg, mean diastolic blood pressure (DBP) was 85.58 ± 9.6 mmHg. Mean fasting blood glucose levels was 194.32 ± 70.59 mg/dl, random blood glucose levels was 278.86 ± 100.75 mg/dl and mean HbA1c levels was 9.13 ± 1.6%. Mean cholesterol levels was 194.15 ± 42.79 mg/dl, mean triglyceride levels was 224 ± 118.12 mg/dl, HDL cholesterol levels was 39.16 ± 7.1 mg/dl and LDL cholesterol levels was 117.62 ± 31.16 mg/dl.
Management of type 2 diabetic patients was complex: 41% of patients on antiplatelet therapy; 27% on anti-hypertensive; 22% on insulin (includes oral hypoglycemic agent + insulin); 20.3% on angiotensin converting enzyme inhibitors and 15.6% on statin medications.
Conclusions: Family physicians were not adequately following the ADA recommended guidelines for comprehensive management of diabetes patients. Inadequate documentation of medical records may reflect poor diabetes care and comorbid conditions of hypertension and hyperlipidemia were not optimally managed according to ADA guidelines. In short, a wide gap exists between practice recommendations and delivery of diabetes care by peripheral diabetes clinics.

No conflict of interest

P-1703

Characteristics and metabolic profile of patients with type 2 diabetes mellitus at a tertiary care centre in Pakistan

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Aims: To assess the proportion of individuals reaching the recommended American Diabetes Association [ADA] goals for glycemic, lipid and blood pressure control.
Methodology: Data on patients presenting to the diabetes clinic, Aga Khan University and Hospital, between 2007 and 2008 were recorded. These included sociodemographic variables, physical measurements and presence of micro and macrovascular complications. Levels of HbA1C, blood sugars, lipid profile, urine microalbumin [UMA], and medications used were recorded. The chi square test of independence was used to assess the association between the categorical variables; the T test was used to compare means of continuous variables.
Results: 1814 diabetic patients were reviewed, mean age (±SD) was 53 (±13) yrs; mean duration of diabetes was 8 (±7) yrs. There were 52.1% males & 47.9% females. Using the Asian cut off values for BMI of 23 for overweight and 25 for obese, 12.5% were overweight, while 72.2% were obese: 76.4% females versus 68.4% males (p< 0.05). Of the overweight and obese individuals, 36.2% were hypertensive as compared to 25.2% of the normal weight individuals (p<0.05). Systolic blood pressure < 130 mmHg was achieved in 57.7%; diastolic blood pressure<80mmHg in 43.2%; HbA1C of < =7.0% in 44.8%; LDL < 100mg/dl in 55%: overweight/obese individuals, 53.9% had LDL> 100mg/dl, versus 35.7% in non overweight (p=0.04); 48.6% had a triglyceride level exceeding 150mg/dl: 54.2% females versus 44.4% males (p=0.018); 35.8% males had HDL > 40 mg/dl; 20.5% females had HDL > 50mg/dl. Normal urinary micro albumin levels were achieved in 63.4%. Microvascular complications were documented in 18.0% ; 38.0% had history of hypertension; 45.5% dyslipidemia; 9.7% heart disease; 1% diabetic foot; 4.7% had a history of depression. Statins were used by 39.2% patients; 24.3% were on insulin; 44% on sulphonylureas, 57.1% on metformin (59.6% overweight/obese were on metformin, and 38.5% normal weight individuals (p<0.05)), 20.7% on glitazones, 2.6% on acarbose; 19.9% on ACE inhibitors, while 12.0% were on angiotensin receptor blockers; 51.3% were on anti platelet agents.
Discussion/conclusion: The majority of diabetics were overweight/obese, with worse lipid profiles as compared to the non obese. Females had worse profiles as compared to males. The glycemic and lipid control were not at the ADA targets. Efforts are required to institute rigorous lifestyle measures and pharmacotherapy to clinch these targets.

No conflict of interest

P-1704

Prospective study: application of technologies in the treatment and control of people with diabetes in rural areas

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Background: Diabetes is a chronic disease that currently has no cure, but it has been proven that education and adequate and timely information can help people with diabetes to lead a normal life and reduce the risk of complications. In countries like Bolivia access to diabetes education is very limited to some urban areas and is non-existent in rural areas for various reasons such as lack of trained health or specialized personnel, little emphasis in Education in levels of decision making in the health area.
The technology, which in Bolivia is throughout the entire republic, including the more remote rural areas, can be used to adequately promote and spread education, providing health care personnel and people with diabetes, simple and useful tools that by implementing an educational technology network with Vivir con Diabetes Center in the lead, to improve the quality of life for people with Diabetes in Bolivia.
Objectives:
- Find new ways for treatment of people with Diabetes.
- Provide more comprehensive care to people who are unable to attend regular check-ups
- Prevent complications in people with diabetes through improved monitoring of their blood glucose levels
- Improving quality of life of people living in rural areas through regular and personalized monitoring.

Sample: Control group: 2 groups of people with diabetes type 1 and 2 that are Vivir con Diabetes Center's patients who are living in rural areas of Cochabamba, Bolivia, and are unable to attend their controls due to economic issues.
Methods: Software development for rural areas that can connect with a system in the Vivir con Diabetes center.

- Database of people, their treatment, weight, BMI, Waist Diameter, Glycated Haemoglobin, Lipid Parameters, Arterial Pressure, Glucose levels and weekly control of the information of the patients.
- Educative software development headed to age groups and social-cultural level of people with Diabetes.
- Basic training in handling of this system to health personnel and community leaders of the rural area.

Expected results: That health personnel in rural areas are trained in Diabetes. That the Community leaders receive basic training in Diabetes and handle of basic computer packages to identify in their rural community people with diabetes.
That people with diabetes living in rural areas have better Management of their diabetes, understand the importance of education and are farthest from the complications.

No conflict of interest

LIVING WITH DIABETES

Living with diabetes

P-1705

Weekend psycho-educational groups to help families better cope with diabetes

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Background and aim: Though the importance of providing psychological support for families as an integral part of diabetes care has – repeatedly - been highlighted, only a handful of such psycho-educational schemes are, currently, implemented in Spanish healthcare institutions.
To provide a service of this kind we propose that an innovative approach - consisting of weekend psycho-educational groups for families of children or adolescents with diabetes - be introduced.
Method: 4 fifteen-hour weekend-seminars on psychology in diabetes: participants were divided into 3 different psycho-educational groups, run by three clinical psychologists with expertise in diabetes care - one for parents of children <12 years, one for parents of adolescents and one for adolescents - with a final joint session.
Subjects: diabetes onset in childhood; diabetes in adolescence; impact of diabetes in the family; parent and child behavior; "Letter to My Diabetes"; daily problems and strategies applied in solving them; what you would ask your parents/child. The program for the adolescent group also included a 3-hour sports session, run by an expert in sports and diabetes.
Parents of children aged 0-18, from all over Spain, were invited by diabetes associations and www.fundaciondiabetes.org; the events were organized by Fundación para la Diabetes.
Results: The 141 parents (56 fathers, 85 mothers) and 46 adolescents who took part in the workshops meant that all four weekends were at 100% capacity.
After the seminar, participants completed a 10-item survey (item range: 1-7) to assess satisfaction levels regarding seminar content. Participants from each of the 4 weekends rated the psycho-educational groups very favorably. General scores for parents' of children<12 years were 6.5, 6.6, 6.8 and 6.64; parents of adolescents: 6.71, 6.7, 6.61 and 6.91; adolescent scores were 6.46, 6.82, 5.58 and 6.6.
Conclusions: Demand for psychological seminars by parents in Spain is high. Program content, organizers and speakers have all received very high marks.
Weekend psycho-educational groups give parents a chance to meet other parents, thus enhancing mutual support among families who face similar experiences.
Psychological support should be made a standard therapeutic component.

No conflict of interest

P-1706

Life style and obesity

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Aims: The main goal of this study was to determine the existence of the correlation between life style and obesity.
Method: We studied 50 subjects with age between 28-74 years, hospitalized in Clinical District Hospital Oradea, between March -May 2008, each subject filled in a form regarding the life style inventory adapted by MacKenzie, which contained a number of eight questions, quantified from 0 to 6, and the body mass index was used for the determination of the weight status.We note in same time the age, sex, living environment.
Results: The studied batch was composed of 26 women (52,0%) and 24 men (48,0%) the ratio women/men being almost 1:1.The subjects came from both rural and urban environments in almost equal proportions (52,0%) urban and (48,0%) rural.The distribution in age groups showed a predominance for the group 42-50 years, followed by the age group 51-60 years. 86% of the subjects belong to the active population. Over 55% of the subjects are obese and only 10% are normal weight. 90% represent the overweight and obese, and they represent a high risk of several co-morbidites with serious implications in public health and in the life quality. Over 68% of the subjects consider that the obligations are higher than the satisfactions, spontaneity is missing almost completely at nearly 75% of the subjects, 60% of the subjects affirm that they increased the use of toxics.The reduction or giving up of hobbies at 84% of the subjects,an important percentage 26% have insomnia owing to the activites they carry out. Analyzing the obtained score from the life style inventory form, it resulted that 62,0% of the subjects have an unhealthy life style, 26,0% a medium one and only 12,0% a healthy one. A correlation between life style and the appearance of obesity has been determined after the statistical calculation, thus unhealthy life style can been seen in 20,0% of the normal weight subjects, at 52,9% of the overweight subjects and at 75,0% of the obese subjects. Obesity is present at 62,0% of the subjects with an unhealthy life style, at 26,0%of those with medium life-style and only at 7,1% of subjects with a healthy life style.
Conclusion: There is a correlation between life style and obesity, unhealthy life style is predominant in the study and it is necessary to intensify the efforts regarding health education

No conflict of interest

P-1707

Type 2 diabetes is an etiologic factor in amenorrhoea and infertility

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Amenorrhoea, the absence of menstruation in a previously menstruating woman of reproductive age, or absence of menarche in a female of 16 years and above, has been associated with many etiologic agents. However, one proposed etiologic mechanism is the role of insulin – a beta pancreatic islet cell hormone involved in glucose metabolism. In type 2 diabetes, the attendant insulin resistance influences the production of sex hormone binding globulins and insulin receptor signaling pathways as seen in polycystic ovarian syndrome, leading to high serum concentration of androgens in women. This pathophysiologic process, with the overwhelmingly increasing incidence of infertility, has compelled a review to elucidate some intrinsic biochemical relationship between type 2 diabetes, polycystic ovarian syndrome, and amenorrhoea. Infertility, a very disturbing outcome of amenorrhoea has traumatized many early marriages in recent times, with a vast majority of latter been characterized by social exclusion, antisocial behaviour, depression, and divorce especially in developing nations. A further understanding of the link between insulin resistance and amenorrhoea, would go a long way to make early detection of infertility possible. Also, the complexity of the process explains why estimation of serum insulin concentration should be employed as a part of the diagnostic algorithm in the assessment of infertility and in a guideline for monitoring type 2 diabetic patients that are experiencing menstrual disorders.

No conflict of interest

P-1708

An adult diabetes specialist nurse perspective of a young person activity weekend, in the UK

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Aim: To engage and encourage young people with diabetes to embrace "normality".

Having diabetes can be psychologically catastrophic, but with little or no contact with others having the same condition, life for a young person with diabetes can be even more stressful.

Young people with diabetes aged between 14 and 17, are invited to an activity weekend in the Lake District, North West England, UK. Here they are able to interact with one and other, whilst sharing similar previous experiences.

Across the North West of England, paediatric diabetes teams are sent information regarding this well established weekend, which is overseen by an MDT of diabetes professionals. A pre-requisite being that their own diabetes team have discussed management and exercise, thus ensuring the young person can titrate, compensate and dose adjust etc as required for the strenuous activity one hopes they will embark on.

From the start of the weekend, all participants are encouraged to self manage their condition, however if this develops into a concern for the young person, professional help may be required. This is by no means a failure on the young person's part, more of a triumph in recognising that their current control may be beyond their own limitations.

The young people are divided into groups. These small groups gel throughout the weekend, and with the support and health promotion from the professionals, the "diabetes communion" is inevitable. Talks arise from within the smaller groups regarding control, insulin management, dose adjustment etc, for once, for many of the young people, providing a playground of new-found normality. Onlookers may observe these smaller groups and see a group of young people eating or drinking before getting onto a canoe, but one cannot help to see that deep down there is a group of likeminded, young people putting their own and even each others safety first, preventing what could turn out to be a disaster on board a one man kayak.

The young people report back the benefits of having such a high level of activity across the weekend. Re-energising oneself not just physically but emotionally and even psychologically. Many young people report that they don't know anyone else with diabetes of their age, not even realising the other young people at their clinic appointments may also have diabetes.

The weekend does not focus on diabetes management, but on reinstating normality in to what can be a very 'abnormal' life at home.

No conflict of interest

P-1709

Diabetes: not a foe but a sweet unfaithful friend

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Aims: Living with diabetes friendly. Spread awareness. Change Misconceptions about diabetes..Help other diabetics.

Methods: Listen to all specialized doctors. Tell my experience with diabetes. Listen to other diabetic's experience.

Results: I and diabetes become best friends and live safely with each other.

Discussion: My name is Marwa I'm 20 years old, living in Cairo-Egypt I'm not embarrassed to have Diabetes since 1995. I learned a lot from my doctor and I'll tell you my long experience with diabetes.

At the beginning: I felt that diabetes is a foe knocked my door, my family and I were extremely shocked worried and afraid, I started shooting anxious questions like why me!

Later: With my parents help I decided to accept to live with this tedious guest who landed in my life so. I'm taking my insulin shots regularly and in time. I do my best to eat moderately. To keep my weight. To avoid junk food. To eat vegetables and fruits on a daily basis. In the morning when I just wake up I say good morning to him by checking my blood sugar and accordingly I plan my day. I always follow my doctor instructions. All my blood tests results are great and my average HbA1c test is 6.4% so my doctor is always very proud of me He even asked me to help him to educate other diabetics in his clinic. I love swimming, riding horses and playing music.

I awarded following appreciation certificates in recognition of my accomplishments in social activities by: Air Force officer's ladies Association. Suzan Mubarak Library for my distinguished contribution in a Music Festival. Certificate of Merit from my high school because I ranked 'first' to the Republic in the authoring and playing music.

So diabetes did not stop me from living a normal life but on the contrary it helped me to be organized and scheduled.

Now when I grow up I study diabetes education and became a Founding member in diabetic youth care association DYCA to help other diabetics. I helped my doctor in the preparation of an audiovisual cartoon film as an education tool for children with diabetes.

The Following are some samples of my participation activities in DYCA events: I could initiate thousands signatures and E-mail messages from Egyptian student colleagues during the 2006 campaign (UNITE for Diabetes) to support UN resolution. I awarded Al Azhar University for coordinating a seminar about avoidance of diabetes complications. I participate in WDD.

Conclusion: I realized that helping other diabetics is a success for myself to defeat diabetes my unfaithful sweet friend. I do believe that living with diabetes needs facing, education and perseverance.

No conflict of interest

P-1710

Need assessment for financial support of people with diabetes: a case study of a developing country like Bangladesh

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Aims: The broad objective of the study was to examine "identify the need for and sources of financial support for persons with diabetes who have low-incomes". The specific objective was to determine: the most financially affected age group of person with diabetes according to occupational category, sources of treatment cost, need for financial aid, and the institution they look to for financial support.

Methods: The data was collected through structured questionnaire from 100 persons with diabetes (having monthly income less than BDT 5000; Exchange Rate: US$ 1 = BD Tk. 70, approximately) of Dhaka City, Bangladesh. Non-probability sampling technique is being used. The research was conducted using the convenience sampling technique. Quantitative and qualitative information related to financial impact of diabetes was developed through the analytical scanning effort. The statistical package (SPSS v.16) was used to conduct the various analyses of the study.

Results: The results show that among different age categories, persons with age 50 or more generally spend monthly BDT 3000 or more. Older persons (50+) with diabetes generally encounter diabetes-related other health complications and thus need higher medical/health related expenditure. The percentage is higher among the unemployed (46.7%), as many retired (normal or forced) people belong in that category. The unemployed spend more than BDT 3000 a month, where their two primary sources of funds/finance are relatives (33.3%) and family wealth (33.3%) respectively. 77.8% of the respondents, whose monthly expenditure for diabetes is more than Tk. 3000, either strongly agree or agree that their expenditure for diabetes is a burden for the family. These expenditures affect other costs of their family, namely food and clothing. Among the respondents, 60% of the unemployed and 35.7% of the housewives want support from Government in the form of monthly donation. They do not have any interest in seeking loan, e.g., micro-credit.

Discussion/conclusion: It is evident from the current study that in most of the cases the persons with diabetes are facing acute financial problems in one form or another. In order to support their recurring treatment cost they have to sacrifice other family and social priorities. It is also evident from the results that the respondents do not want to be entered into hard financial contract like micro-credit arrangement; rather they would prefer donation, medicinal support and other form of soft term financial mechanism to support their financial need owing to diabetes. Future research job would be to find out a support mechanism that is both socially and financially feasible for the numerous persons with diabetes.

No conflict of interest

P-1711

Diabetes education and care in a developing country: observations from Karachi, Pakistan

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Introduction: Education and care are the cornerstones of diabetes management. Standards have been suggested by experts but in most of the low resource communities meeting those standards is not assured, not only due to lack of resources but also because of lack of awareness. Assessment of areas needing particular attention could assist in improving the situation. This study explored the kind of care that is being received by a sample of middle income group subjects with diabetes in Karachi.
Material and methods: Information was collected from 105 type 2 diabetics through a pre-tested self administered questionnaire distributed in two colleges to students having any adult with onset diabetes in the family.
Results: Proportion of male and females in the sample was comparable. Diabetes was being managed by diet alone by 37%, diet and insulin by 20% and by diet and OHA by 43% of the subjects. Several important assessments e.g. Lipids, OGTT, HbA1c, Urine albumin, feet check, had never been for more than 50% of the subjects. More than 90% subjects received information about diet and causes of diabetes; and more than 70 % had been informed about diabetes complications, foot care, dental care, self monitoring of blood glucose and testing sugar in urine, and 48% had been educated about insulin injections. For various aspects of diabetes education 70 to 90%subjects reported getting it from physician, 0 to 5% from nurse, 1-16% from dietitian and 4 to 15% from printed material. Only in 16% of cases dietary information was given by dietitian, Subjects also reported getting information about these aspects from family (57 to 88%), newspaper (25 to 50%), and television (31 to 62%) also.
Conclusion: It could be concluded that majority of subject had received information but because physician usually don't have time for detailed education and information is being supplemented by non professional sources its validity needs to be assessed. In terms of clinical assessment, situation needs to be improved as many suggested tests had never been done for a large number of subjects. The study needs to be replicated with a larger sample.

No conflict of interest

P-1712

Complex evaluation of quality of life in patients with type 2 diabetes

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Aim: to make complex evaluation of quality of life in patients with type 2 diabetes.
Methods: The subjects of the study were 50 patients (24 men and 26 women, age 52,57±5,09 years old) with type 2 diabetes for more than two years, and 32 healthy control subjects (14 men and 18 women, age 47,35±5,44 years old).
Complex evaluation of quality of life was estimated with nonspecific questionnaire MOS SF – 36 (Medical Outcomes Study 36-Item Short-Form Health-Survey). Nonspecific questionnaire «Feeling. Activity. Mood.» (FAM) was used to assess psychological status of patients. This questionnaire consists of 3 points, including 30 polar statements that reflect psychoemotional status. Specific (only for people with diabetes) questionnaire «The Self Efficacy or Diabetes Scale» consists of 8 points and is aimed to assess patient's level of confidence in grades 1 to 10.
Data analysis was conducted with applicable computer program STATISTICA 6,0. and presented in M±d.
Results: According to SF-36, patients with type 2 diabetes have worse quality of life over all 9 scales to compare with control group (Table 1).

Table 1 - Results study of quality of life by SF-36.

Rating scale	Patients with type 2 diabetes (M± d)	Control group (M± d)
Physical Functioning	23,6±3,76*	26,52±2,65*
Role Physical	5,54±1,68*	6.88±1,34*
Bodily Pain	6,84±2,13*	9,28±2,24*
General Health	2,0±0,75*	2,88±0,68*
Vitality	29,6±7,00*	36,00±6,33*
Social Functioning	7,56±1,73*	8,08±1,55*
Role Emotional	4,61±1,29*	5,98±0,98*
Mental Health	12,86±2,74*	14,48±2,12*
Change Health	2,72±1,03*	3,00±0,57*

*- p<0,05
According to SF-36 a better quality of life was both in women with diabetes type 2 and in control group, compared that in men (Figure 2).
According to results FAM it was revealed that psychoemotional status in type 2 diabetes group is lower than that in controls. This law is traced back in the analysis of well-being scale (Table 2).

Rating scale	Patients with type 2 diabetes (M± d)	Control group (M± d)
Feeling	44,22±12,98*	52,6±8,65*
Activity	47,43±10,88*	49,42±8,79*
Mood	50,77±9,92*	53,7±8,54*

*- p<0,05
Study results of quality of life according to SED revealed that confidence index in diabetic patients has mean range (5,41 to 7,88 grades). Patients are less confident in their physical capacity and self-test capability of glucose level during bodily exercises.
Conclusion: This study demonstrates worse quality of life in patients with type 2 diabetes. According to SF-36 quality of life was better among women than men, both with type 2 diabetes and controls. The results of all questionnaires improved dissatisfactory quality of life in patients with type 2 diabetes.

No conflict of interest

P-1713

Diatletic: 1st edition of the Spanish half marathon championship for athletes with diabetes

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Objective
Diatletic is a team of athletes with diabetes founded by Fundación para la Diabetes and whose principal aims are:
- To promote balanced forms of physical exercise.
- To declare, as a statement of principle, that no person should abstain from doing sports simply because they have diabetes.
- To foster experience exchanges among athletes with diabetes.
- To do away with the idea that risk of severe hypoglycemia is a valid pretext in excluding people from specific jobs.

Method: Fundación para la Diabetes has sponsored participation by athletes with diabetes in the Granollers Half Marathon from 2006 to 2009.
Sponsorship comprises: covering registration fees, providing special assistance at supply points throughout the race, and offering Diatletic runners food and lodging, once the race is over.
Results: Diatletic Team athlete involvement in the Granollers Half Marathon has increased consistently, since 2006. In 2006, there were 14 athletes; 19 in 2007; 25 in 2008; 35 in 2009. In all, 57 different athletes with diabetes have taken part, over the 1,962 km. and 4 editions of the race: 48 men and 9 women. Average runner age was 37 (24-54), while mean duration of diabetes is 12 years (12-41). No severe hypoglycemic or ketoacidosis episodes were recorded.
2009 marked the first edition of the Spanish Diatletic Championship. The first of the 35 participants to cross the finish line did so in 1 hour and 17 minutes.
Conclusion: Though sport, generally, represents a challenge both for young DM1 patients and for the healthcare professionals who treat them, there are ways to make it safe, so long as motivated experts can provide people with the necessary level of information and training, and by introducing both adjusted pharmacological treatment and carbohydrate intake.
In addition to the direct physical and psychological benefits such sporting activities can bring, they also serve to change the negative perception of diabetics as people with limitations.

No conflict of interest

P-1714

Type 1 diabetes in the have not children in India - project "Disha" and the free "insulin life line" program in the state of Karnataka, India: pseudoaltruism or real justice ?

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The life of children and youth with diabetes in India, especially from the poorer sections of society, is full of unique additional struggles and hopelessness: 1. "Death before diagnosis" - lack of awareness and diagnostic facilities, especially in rural areas; 2. Unaffordability of insulin and medical care - costs often 25 – 50% of total family income; 3. Discrimination in education, future employment and family life 4. Non-existent governmental programs or even concern.

Since 1994, in a small attempt to improve this grave situation, Samatvam Trust - Jnana Sanjeevini Medical Center, has tried to support 500 children through charity Project DISHA and Insulin Lifeline Program (Karnataka State total population 53 million). The activities include: FREE Childhood Diabetes Clinic - first Sunday of every month, provision of FREE insulin and syringes, health education and counseling, social support – "Adopt a child", patient – parent support groups, residential health – recreation camps etc. Currently about 200 children are actively attending the clinic (rest untraceable or maybe dead). FREE insulin for this program has been procured through diverse sources, occasionally, strange sources: bulk purchased at discounted rates; pharmaceutical industry 'social' programs – often erratic and unfortunately business linked; short expiry and left over insulins from industry and hospitals; participation in limited time bound clinical trials; samples gifted by good samaritans (overseas friends, families of recently dead insulin using adults !!!) etc. During extreme scarcity of insulin stocks in the program, we were forced to implement rationing and reservation towards children of the lowest poverty rank order, even among the poor. SHBGM has been an unavailable luxury till recently (now 6 -10 blood glucose strips provided per child per month); HbA1c unaffordable; TSH measured only on strong clinical suspicion.

Distressingly, self realizing the grossly suboptimal care these youngsters are receiving, we often question ourselves whether we are justified in prolonging the misery of these children, just to let them succumb helplessly few years later (infections, hypoglycemia, DKA, renal failure etc), and disappear from this rather cruel and uncaring world

No conflict of interest

P-1715

Diabetes in Africa: lessons from two lived experiences

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Aims:

- Explore challenges and triumphs of managing diabetes in Tanzania, Africa, June-July 2008, while a student with the International Tanzania Study Tour, Dalhousie University, Canada;
- Building on experiences in The Gambia, Africa, July-September 2006 in developing and implementing diabetes education and prevention program, the lived Gambian diabetes experience is compared, contrasted to the lived Tanzanian diabetes experience;
- Relate similarities and differences from the African visits to clinical interactions as a Diabetes Case Management Coordinator in Nova Scotia, Canada, and how practice has changed as a result;
- Present a personal picture of the growing epidemic in Africa;
- Discuss the success of community based organizations (CBOs) in Tanzania in HIV testing, education and prevention and nutritional, financial, and spiritual support;
- Apply lessons learned and insights obtained from Gambian and Tanzanian travels to personal and professional growth as a nurse and global citizen.
- Methods: - Anecdotal, informal interviews with individuals living with diabetes in Tanzania;
- Discussion with healthcare professionals about managing diabetes in Tanzania, hospital and community, (monitoring blood glucose, using medications, adhering to a "diabetic diet");
- Personal reflection, journal writing;
- Literature review: managing diabetes in a resource-poor environment,
- Culture immersion: language, food, social connectedness.

Results:

- The lived experience of diabetes in Tanzania and The Gambia is similar to lived experience in Nova Scotia, Canada, despite differences in geography, economics and culture;
- Diabetes is a chronic disease affecting individuals, families, and communities because it is largely managed by diet and lifestyle, and thereby greatly influenced by culture and socioeconomics;
- Living in a resource-rich environment did not always ensure good glycemic control, and likewise, reasonable glycemic control is achievable in a resource-poor environment;
- Support (family, healthcare team, and community) are key elements for success in both a resource-poor and -rich environment;

Discussion/conclusion:

- Diabetes: a chronic disease, a global epidemic. Educating, preventing and managing diabetes in Africa impacts the world, as educating, preventing and managing AIDS in Africa impacts the world;
- Diabetes education centres in Tanzania are a successful model of care for resource-poor nations to follow;
- Adapting AIDS CBOs to diabetes is one community-minded strategy to prevent, educate and manage the diabetes epidemic, for resource-poor and rich environments;
- The world is a small place, we are all connected, and our commonalities are greater than our differences. We are all human.

Conflict of interest:
Advisory board: Sanofi-Aventis Diabetes Educator Advisory Board, LifeScan Canada Advisory Board

P-1716

Impact of a knowledge-sharing network of diabetic patients in Mali on quality of life: baseline survey

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Background: In Sikasso, Mali, a knowledge-sharing network was set up in May 2008 that aimed at bringing together diabetic and non diabetic patients, sharing knowledge through various activities and promoting social relationships.

Aims: To assess the efficiency of this network.

Methods: This survey is the baseline round of a quasi-experimental study. Face to face interviews were conducted in Bambara using a questionnaire made of 4 parts: (1) socio-demographic characteristics (2) assessment of the quality of life (QoL) through the WHO-QoL brief questionnaire (3) assessment of the social relationships (4) assessment of the impact of diabetes on health through 15 questions taken from the Diabetes QoL questionnaire.

Controls matched for age and sex were drawn from the association of diabetic patients of Sikasso.

Results: Of the 74 subjects included in this baseline study, 45 (61%) participated in the network and 29 (39%) were controls. The sex ratio, matrimonial status, educational level, age distribution and ethnic groups were similar between the two groups.

Clinical stage: 36% [21;50] of the network participants and 52% [33;71] of the control declared a clinical complication of diabetes (p=0.2). The most frequent complication was retinopathy.

QoL: The physical dimension of the QoL was greater for female than male (p=0.03), for people with a regular work (p=0.001) and for participants in the network compared to controls (p=0.02). The social dimension of QoL was also better for participants in the network than for controls (p<0.01).

Social relationships: Almost 90% of the participants and controls reported 1 or several close friends. The number of friends ranged between 1 and more than 6 without significant difference between the two groups (p=0.9) and the duration of friendship was most often longer than 2 years. The relationship with friends and their support were considered either as satisfactory or very satisfactory. Most of the subjects did not find that diabetes may limit their relationships (97% [94-100]).

Impact of diabetes on day to day life: Difficulties were reported for 75% [66;86] of the subjects and there was no significant difference between participants and controls. The most frequent difficulties were financial (62% of the case) following by physical (23%). Of the participants to this study, 10% [5-20] never disclosed their disease.

Conclusion: Whereas the two groups were similar according to their socio-demographic characteristics, a better QoL was found for the participants in the network. This could reflect an early effect of this program as well as a selected population.
Neither participants in the network nor controls reported difficulties related to their social relation. However, there was a significant impact of diabetes on their day to day life.

No conflict of interest

P-1717

Thirty four years down the line with diabetes

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Introduction: I am a Diabetologist in Kenya diagnosed with Diabetes 34 years ago.My life and experience with diabetes in Africa has been a case of "a tale of two cities" where in a resource poor setting I have graduated from using Bovine insulin to analogue insulin using an Insulin pump. I have moved from urine testing using benedict's solution to continuous glucose monitoring.
Diagnosis with Diabetes: The time period of my diagnosis seems rather vague, however the unquenchable thirst and fatigue is unforgettable. I vividly remember putting my mouth on a spout of a water tap to try and drink water to quench my thirst. I was first diagnosed with a urine infection and as my condition deteriorated an experienced expatriate General Practitioner in town was able to diagnose diabetes and I was admitted in hospital with Ketoacidosis. At the time of diagnosis I wasn't aware of what I was going through and the true reality of the disease process set in as I went through my teenage years
My Experience and challenges with Diabetes:
As I grew up I realized that most doctors had minimal knowledge and expertise in the field of Diabetes. There was no nutritional, diabetes education given. In my early years with Diabetes I was frustrated and confused with no real understanding of what was happening to me. Medical follow up was then erratic and unstructured. Doctors visits were only when I was unwell. I used glass and plastic syringes with reusable needles which needed boiling before each injection. Urine glucose testing when available was a laborious process using benedict's solution. Blood glucose meters were only available in the late 1980 and 1990 but the high cost of strips and infrequent availability of strips meant blood glucose monitoring was seldom done. Hypoglycemia was a great concern in my youth and it created a sense of loss of control of my body, and lifestyle.The fear of hypoglycaemia created anxiety and great concern to my family members and teachers.Insulin Shortages were a concern and an accidental breakage of an Insulin vial often meant that I would have to go for day or so without insulin. Over time I realized that effective management of Diabetes could only be achieved if I understood the disease and made necessary changes and adjustments. I was able to formulate realistic and attainable treatment goals.I was able to mould Diabetes round me rather than myself around Diabetes. I decided to pursue a career in diabetology to ensure I have the tools and knowledge to look after myself and also give back to the society my knowledge and experience.My experience 34 yrs down the line with diabetes is an indication that diabetics even in resource poor setting can have a fulfilling life and realize their dreams and objectives if given the necessary tools and support.

No conflict of interest

P-1718

Cardiometabolic risk behavior among adults living with diabetes mellitus in Tanzania: a call for action

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Introduction: Diabetes mellitus is now a pandemic in distribution. However, inequities in the allocation of resources especially to the most remote areas of continental Africa have posed a big challenge to the health systems of most African nations. Awareness raising for cardiometabolic risk factors has proven to be an essential tool for preventive strategies against modifiable risk factors for metabolic diseases. However, not much is known of the extent of cardiometabolic risk behavior among people living with diabetes mellitus who regularly visit diabetes clinics for care.
Objective: To assess practices on cardiometabolic risk behavior among adults with type 2 diabetes attending a tertiary diabetes clinic in Dar es Salaam, Tanzania.
Methodology: A cross-sectional survey was done in July-Sept 2007 involving adult type 2 diabetes patients attending a tertiary diabetes clinic at Muhimbili National Hospital. Data were collected using semi-structured questionnaires. Data were analysed using epi-info version 3.3.2. Statistical significance tests included the usage of X^2 test to check for the association between different variables and P-value < 0.05 to account for the role of chance in findings.
Results: A total of 108 diabetes patients were surveyed. Out of whom, 66 (61.1%) were females. Significant amount (22.4%) of respondents declared to be regular alcohol drinkers with males outweighing females in frequency (P=0.05) Almost 10% of male respondents revealed to have smoked at least once within 24 hours prior to the survey time (P=0.0000). None among the study respondents revealed to perform blood/urine sugar on a daily basis. Long duration of diabetes state was strongly associated with higher frequency of blood/urine sugar tests (P=0.003). Significant number (87.75%) of respondents perceived eating practices to affect diabetes and its outcomes.
Conclusion: Significant amount of respondents were active smokers and alcohol users.
Recommendation: More education is needed on cardiometabolic risk factors especially among people living with chronic diseases like diabetes mellitus. There is a desperate need for a regular assessment of depressive illnesses among people with diabetes mellitus, and the extent by which depression influences early diabetes morbidity and mortality

No conflict of interest

P-1719

The effect of "GIDIUBE" on the glycemic control of its participants

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The Gymkhana Diabetics of Uberaba - GIDIUBE, held in this municipality, has as main objective provide an education day for healthy individuals, diabetes patients and their family members about this morbidity, in commemoration of the world day of diabetes. In addition to the educative character, the event includes screening and control of some parameters correlated with diabetes and the metabolic syndrome in their participants, such as: levels of fasting glycemia and post-prandial, levels of cholesterol and triglycerides, in addition to the calibration of the values of blood pressure, of the weight and abdominal circumference of the same.
Methodology: Performed questionnaire, measured in fasting glycemia and post-prandial, weight, height. Data were analyzed by SPSS 14.0 program.
Results: Among 126 participants of the activity we have seen: 31% of diabetes. The average statistics – found: age 65.18 ± 1.3 years, fasting glycemia - 112 ± 5.4 mg/dl, glycemia post-prandial – 136.1 ± 6.8 mg/dl, body mass index (BMI) – 27.1 ± 0.6 kg/m^2. Among diabetics, 44.4% were fasting glycemia, 22.2% normal blood glucose between 100-125 and 33.3% fasting glycemia above 126 mg/dl. Five new diagnoses were made during the event (3.9%). In relation to post-prandial glucose 45.8% of diabetics maintained a normal level (2 h < 140 mg/dl).
Conclusions: The day educative may serve as a warning to the susceptible individuals to the development of diabetes mellitus, contributing to the reduction of the need of care with the disease, the complications associated with it; in patients with DM, involves the detection and prevention of early complications. In addition to the education program have a low cost compared with medicines and with the therapeutics specifies (hemodialysis, laser, hospitalizations, treatments of ulcers, amputation of limbs and cardiovascular problems) and be objective, it is primarily a reduction in the cases of diabetes in the future, obtained mainly with an improvement and/or control of ideal levels of blood glucose of participants.

No conflict of interest

P-1720

Living with diabetes

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When one is newly diagnosed with diabetes, one hardly believes that one will live with diabetes for the rest of one's life. If a patient's blood glucose is very high and this patient is placed on insulin, this patient has the impression that once the insulin is completely used, diabetes will be treated. In a situation where the patient is placed on oral treatment, the patient too has the impression that by the time the packet of drug gets finished, diabetes will be treated. Hardly will they know that diabetes is an illness he or she will be living with till death. As time goes on, EDUCATION starts to play a vital role in the patient's lifestyle. Diabetes is a METABOLIC SYNDROME.

What to do living with diabetes:

1. The patient has to monitor the blood sugar so as to maintain it under control.
2. The patient has to take his or her medications regularly.
3. Follow up a diet plan and moderate food items that carry up blood sugar.
4. Exercise regularly
5. The patient should watch out his or her weight.
6. Maintain good body hygiene so as to prevent infections.
7. Make regular check ups of the heart, eyes, kidneys, teeth and feet.
8. The patient should know the complications warning symptoms.
9. Living with diabetes is a major issue and a prime concern.

No conflict of interest

P-1721

Insulin bank system

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Introduction and background: Insulin is one of the most expensive anti diabetic's drugs without it, life can be meangless for children and adults, research has shown that, children without insulin their life span is a year and adults five years. Therefore insulin is one of the essential anti diabetic's drugs for managing diabetes both in type1and 2. In Uganda, particularly west Nile region, we have created insulin bank system. This is where insulin is brought in the districts of west Nile through the Arua Diabetes Association and the patients sells their Chicken, Beans, Matoke and come to buy the insulin at reduced price. The Associations are attach to District hospitals and health centers whereby the patients are able to access the medical services which are provided to them by trained health workers. The Diabetic nurses and educators provide information and give Diabetic education to the patients about how to keep insulin.

Method: The most assured way is by using the clay pots for keeping the insulin. This consists of;

1. Clay pot.
2. River sand.
3. Water.
4. Plastic cup.
5. Pot cover.

Water to be added to the river sand whenever necessary.

The trained health worker instructs the patient how to keep the insulin in the pot which is a halfway filled with the river sand. The pot stands on a basin of river sand. The coldness developed by the sand keeps the plastic cup cold and favorable for the insulin.

Then plastic cup is inserted in the pot half way, inside the plastic cup no water add and you now place your insulin in the plastic cup and keep it covered.

This is the safest way of keeping insulin in our set up, then when you want use it you pick your medicine, you inject and keep it back for the next time.

Results:

1. 90% of the patients have well controlled blood glucose level compared to 10% who don't follow the above method.
2. It is cheap and available for 100% patient who are on insulin.
3. It is affordable.
4. Most reliable way of keeping insulin.
5. It doesn't need electricity
6. It can be used in the rural set up of the village.

Conclusions: Most patients on insulin and following the above method have well controlled blood glucose level hence improving the quality of life.

No conflict of interest

Media, and public awareness

P-1722

Creating awareness and comparative screening for diabetes in rural (Isara) and urban (Sagamu) communities in Ogun State, Nigeria

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Background/aim: Non-communicable diseases account for a large proportion of morbidity and mortality in Nigeria. Diabetes mellitus is the most common endocrine disorder in Nigeria - within three decades, the prevalence rose six fold. The role of community participation in the prevention of diabetes and hypertension cannot be overemphasized. This informed the study, with the aim of creating awareness at the grassroot community level, emphasising preventive measures.

Methods: In 2007, a diabetes awareness campaign with free blood glucose screening, aimed at preventing diabetes was conducted within rural Isara community and urban Sagamu community in Remo division in Ogun state, Nigeria. Diabetes was defined as fasting blood glucose > 126mg/dl and random blood glucose > 200mg/dl. Hypertension was defined as blood pressure measurements > 140/90 mmHg. Obesity was also assessed using Body Mass Index and the waist – hip ratio. Data was analyzed using SPSS software version 13.

Results: In rural community of Isara, two hundred and forty respondents (18-80years) were screened during the campaign for diabetes and hypertension. The mean age, Body Mass Index and Waist-Hip ratio were 53.9±15.7years, 25.9±4.8 Kg/m2 and 0.91±0.08 respectively. The mean random blood glucose was 102.9 ± 25.5 mg/dl. The mean systolic blood pressure was 134.2±24.8 mmHg, while the mean diastolic blood pressure was 78.7±14.4mmHg.

In the urban Sagamu community, a total of 340 respondents were screened. The mean age, Body Mass Index and Waist-Hip ratio were 47.7±15.4years, 28.8±6.3 Kg/m2 and 0.99±0.1 respectively. The mean fasting blood glucose was 95.2±32.9 mg/dl. The mean systolic blood pressure was 128.8±18.6 mmHg, while the mean diastolic blood pressure was 82.1±12.4mmHg.

Conclusions: Our findings suggest that overweight and obesity are becoming a public health burden in the urban Nigerian community. Creating awareness on diabetes and hypertension and instituting lifestyle modification measures to curb non-communicable disease and obesity are of paramount importance.

No conflict of interest

P-1723

Social networks in internet and diabetes divulgation

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Aims: To define and to list some of the main internet social networks, highlighting those linked to diabetes. To observe the growth of this kind of communication proving to be possible to use it to spread information about diabetes.

Methods: By analyzing the amount of virtual communities, blogs, fotologs, videologs, microblogs, etc; evaluation of related studies; evolution of behaviour in Brazil.

Results: Internet Social Networks are the relationship between persons in the communication mediated by computers. These systems work by social interaction, trying to connect people and allow their communication (Wikipedia). With the appearance of web 2.0 (in which the main point is the user participation) the interest of the users in expressing their opinion has increased. CGM - Consumer-Generated Media - is the term used for information communicated by the user and it is linked to comments, forums, discussion lists, blogs, fotologs, videologs, virtual communities, microblogs and wikis. All these ways of expression have grown in an incredibly fast manner. In 1999, 'The page of only weblogs', by Jesse James Garret, registered the existence of 23 blogs. In 2000, there were more than 102,499 only written in Spanish language. In a Google search combining the words blog+diabetes, the number of results is up to 5,600,000. In two of the most important social networks of the world – Facebook (most used in USA) and Orkut (most used in Brazil) – almost 1,000 communities were found, 530 and 408 respectively. The 5 first Orkut communities have together 16,979 members. In a research done in photo/image sharing social networks were found 37,000 photos in

Flickr and 108,000 in Picasa with the tag 'diabetes'. A recent research done by Nielsen has concluded that Brazilian web users (62.3 millions of web users according to IBOPE) are using the social networks more than the email (80% of Brazilians) and that 17 millions use Orkut. Dieese's report showed that in 2008 one computer was sold at each 3 seconds.

Conclusion: Social interaction that occurs in internet makes effective connections. Communication done this way makes thing less impositive and more spontaneous. The internet user turns to be more to the message. Entities related to diabetes couldn't be apart from this tool which can be developed with a low budget and with expressive results in the improvement of the quality of life of people with diabetes.

No conflict of interest

P-1724

World diabetes day in Brazil in version web 2.0

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Aims: To evaluate the use of internet and internet users' participation in publicizing World Diabetes Day activities in Brazil; use of social networks and how these strategies can reduce publicity costs.

Methods: By analyzing the number of visits and pageviews of the World Diabetes Day hotsite; amount of online forms filled with activities and with photos attached; and an evaluation of social networks.

Results: In 2008 the SBD website staff (journalism/photography/webmaster) proposed a hotsite creation exclusive for World Diabetes Day in which web 2.0 strategies would be used, that means an active participation of Brazilian internet users. The hotsite's first version - www.diamundialdodiabetes.org.br – was created in 2007 to publicize activities realized for the 14th November, but it was in 2008 that the community participation was higher. To make this happen, the hotsite worked with the Web 2.0 concept by creating alternatives to make the interaction between the website and the user. Forms were created for any person who wanted to send photos, texts and videos with the activities that happened in Brazil. To incentivize the community and SBD fellows the headlights on the hotsite homepage supported by the publicity on SBD website – www.diabetes.org.br – were done. The motivation was the publication of all the stuff that was sent to the newsroom. This is one of the strategies to make the user proud of the stuff sent by him. The hotsite had about 70,000 pageviews on November, 2008. Two hundred forms were filled up, as well as a lot of emails sent to info@diabetes.org.br. The journalism staff used a network called Flickr that has an excellent acceptance by Brazilian internet users. More than 260 photos were published in Flickr, which is a website defined as a social network whose objective is to store and to share photos. All photos can be tagged, making finding and web dissemination easier. A Flickr account was created (www.flickr.com/socbrasdiabetes) to publish the photos of the blue-lit monuments and activities in Brazil. The number of photo views was more than 20,000.

Conclusion: Diabetes websites can create strategies for the World Diabetes Day publicity can be done with regular investments using internet/web to call authorities, media and population attention.

No conflict of interest

P-1725

Five years experience in "Healthy Run" promotion.

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Obesity and type 2 diabetes mellitus (T2DM) represent major health concerns worldwide. The prevalence of diabetes mellitus is around 12% locally. However, burden of diabetes mellitus is projected to increase by 50-80% by 2025. A number of population studies, such as Finnish Diabetes Prevention Studies, Diabetes Prevention Programme and Da Quin Studies all support prevention of T2DM by life style modification. Since 2005, Diabetes Hongkong has been organizing yearly Healthy Run for the public. A subcommittee was formed and a coordinator was appointed to coordinate with various voluntary groups and helpers. The table below depicts the progress in the past five years. We concluded that it has been a successful programme in promoting public awareness of exercise in prevention of obesity and diabetes mellitus. Also, it has been important in promoting image of Diabetes Hongkong which is helpful in our fund raising program.

Year	Total	M<45	M>45	F<45	F>45	<18
2005	67	38	15	10	4	
2006	212	71	83	33	25	
2007	427	125	157	38	32	
2008	668	175	275	80	32	89
2009	1318	536	450	158	32	86

No conflict of interest

LATE-BREAKING ABSTRACTS

P-1726

The evolutionary paradox of the the polycystic ovary syndrome and the global diabetes epidemic: a Fertility First hypothesis

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The high global prevalence of the Polycystic Ovary Syndrome (PCOS), a heritable cause of ovarian infertility, is a stark evolutionary paradox which provides insight into the rapidly increasing prevalence of cardiovascular disease and diabetes in contemporary populations, particularly in the developing world. We propose that PCOS, Type 2 diabetes (T2D) and the Metabolic Syndrome (MetS) are modern phenotypic expressions of a metabolic genotype attuned to the dietary and energetic conditions of the Pleistocene - an era in which humans were hunter gatherers with a substantially meat-based, high protein, low carbohydrate diet. This metabolic "Fertility First" rather than "Thrifty" genotype persisted at high prevalence throughout the entire agrarian period – from around 12000 years ago until 1800 AD – because, we contend, in an environment defined by chronic and often severe seasonal food shortage, it helped to sustain ovulation, which, in humans, is exquisitely sensitive to energy balance and flux. Conversely, we argue that genetic adaptations to a high carbohydrate, low protein agrarian diet, necessary adaptations to, variously, population growth, climate change and megafaunal extinction, were constrained because they also compromised fertility by raising the lower bound of body weight and energy intake optimal for ovulation and reproduction. After 1800, the progressive attainment of dietary energy sufficiency released human populations from this adaptive constraint. This release, through the powerful mechanism of fertility selection, increased, in decades rather than centuries, the prevalence of a genotype better suited to carbohydrate metabolism. This putative mechanism for rapid and recent human evolution can explain the lower susceptibility to T2D of today's Europid populations. This hypothesis predicts that the increasing rates of diabetes and cardiovascular disease which typically accompany economic development will be tempered by natural, but particularly fertility, selection against the conserved ancestral genotypes which currently underpin them.

No conflict of interest

P-1727

Insulin resistance temporarily induced in healthy male subjects results in increased postprandial GIP, but not GLP-1 responses

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Background and aims: Glucose-dependent insulinotropic polypeptide (GIP) and glucagon-like peptide-1 (GLP-1) are incretin hormones - with well documented insulin-releasing actions - secreted from the small intestine in response to feeding. GIP receptors are found in a number of peripheral tissues including adipocytes. GIP-R-mediated effects have been suggested to be a key link between consumption of high fat diets and the development of obesity, insulin resistance and type 2 diabetes. Obese patients with type 2 diabetes are characterised by increased postprandial GIP responses (promoting obesity

and insulin resistance) and reduced postprandial GLP-1 responses (promoting glucose intolerance). We aimed to determine the impact of insulin resistance on postprandial GIP and GLP-1 responses.
Materials and methods: Postprandial GIP and GLP-1 responses were measured using a 520 kcal-liquid meal test (58 g carbohydrate, 28 g fat and 10 g protein) in 10 healthy Caucasian male subjects without family history of diabetes (age: 23.9±3.1 years (mean±SD); BMI: 24.1±1.7 kg/m^2; fasting plasma glucose: 4.9±0.3 mM, HbA_1c: 5.4±0.1%) before and after induction of insulin resistance using high calorie diet, relative physical inactivity and administration of prednisolone (37.5 mg/day) for 10 days.
Results: The intervention had a significant impact on insulin resistance according to the homeostatic model assessment (1.4±0.1 vs 2.3±0.4, p=0.02) without affecting body weight. In line with this, fasting insulin levels (36±3 vs 61±6 pM, p=0.03) and insulin responses (area under curve) increased following the intervention (22±6 vs 43±13 nM·4h, p=0.03). The impaired insulin sensitivity had no impact on postprandial GLP-1 responses (1.5±1 vs 2.0±1 nM·4h, p=0.56), but postprandial GIP responses rose significantly following induction of insulin resistance (6.2±1.0 vs 10.0±1.3 nM·4h, p=0.002).
Conclusion: These data show that induction of insulin resistance using prednisolone, high calorie diet and relative physical inactivity results in increased postprandial GIP responses, suggesting that increased GIP secretion in obesity may occur as a consequence of insulin resistance rather than being a primary cause of obesity and insulin resistance. Additionally, our data suggest that insulin resistance is not directly responsible for the reduced postprandial GLP-1 responses observed in obese individuals with type 2 diabetes.
The study was supported by an EFSD/Novartis grant

No conflict of interest

P-1728

ATM protein kinase mediates full activation of AKT and regulates glucose uptake in response to insulin in muscle cells

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Aims: Ataxia-telangiectasia (A-T) is an autosomal recessive disorder characterized by cerebellar ataxia and oculocutaneous telangiectasias. Patients with A-T also have high incidences of type 2 diabetes. The gene mutated in this disease, ATM (A-T, mutated), encodes a 370-kDa protein kinase. Previous results from our group and others have shown that cytoplasmic ATM is an insulin responsive protein (Yang et al, Nat. Cell Bio., 2000) that mediates full activation of Akt. Our recent results have shown that ATM stimulates GLUT4 translocation through regulation of Akt activity in muscle cells (Halaby et al., Cell Signal, 2008). The objective of this study is to further test the functional link between ATM and insulin-mediated glucose uptake in muscle cells.
Methods: We treated L6 muscle cells with a specific inhibitor of ATM, KU-55933, and a specific activator of ATM, chloroquin, and measured their effect on phosphorylation of GSK-3β and glycogen synthase. We also tested the effect of chloroquin on Akt activity in L6 muscle cells and in muscle tissue of high-fat-fed rats, an animal model of insulin resistance.
Results: We found that insulin-mediated phosphorylation of GSK-3β at Ser-9 in L6 myoblast was greatly reduced by KU-55933. In addition, a substantial increase in phosphorylation of glycogen synthase was observed in KU-55933 treated L6 cells. In contrast, treatment with choloroquin led to enhanced phosphorylation of GSK-3β and decreased phosphorylation of glycogen synthase, suggesting that ATM may positively regulates glycogen synthesis through inhibition of GSK activity. Next, a 2-deoxyglucose assay was performed to determine the effect of chloroquin on glucose uptake in L6 cells. In cells treated with both insulin and chloroquin, glucose uptake was 2.3-fold higher than that in cells treated with only insulin, suggesting that chloroquin is a potent activator of glucose uptake in L6 muscle cells. In addition, treatment of L6 myoblasts with chloroquin resulted in a marked increase in Akt phosphorylation at Ser473 as compared to cells treated with insulin alone. This result again confirms the role of ATM in the activation of Akt. To further study the role of ATM in insulin signaling in vivo, we tested the effect of chloroquin on Akt activity in high-fat-fed rats. We found that the inhibition of insulin-mediated Akt activity in muscle tissue of high-fat-fed rats was partially reversed when these rats were treated with chloroquin. The effect of chloroquin on phosphorylation of GSK-3β and glycogen synthase in this animal model is currently under investigation.
Discussion/conclusion: Our findings demonstrate that ATM, in addition to its role in regulating Glut4 translocation, also stimulates insulin-mediated glucose uptake by up-regulating glycogen synthesis. Chloroquin has been widely used as an anti-malarial drug. Our results suggest that chloroquin may also be used as a novel therapeutic agent targeting type 2 diabetes.

No conflict of interest

P-1729

Increased diabetogenicity in a presumed low-risk cohort of pregnant Scandinavian women. A prospective longitudinal study (2002-2005 and 2005-2008)

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Aims: To monitor anthropometry, glucose and insulin metabolism and pregnancy outcome prospectively in a large cohort of pregnant women to elucidate mechanisms that influence glycemic control.
Methods: 1032 previously healthy pregnant Scandinavian women booked at our hospital, underwent 75g-OGTT at week 14-16 and 30-32, in addition anthropometry of mother and infant were done. Comparisons between the cohorts were done with t-test or chi square test, for overall trends, ANOVA was used.

Cohort characteristics mean (SD)	2002-2005 (n=553)	2005-2008 (n=479)	
Maternal age (years)	31,2 (4)	31,3 (4)	ns
Maternal weight (kg, week 14-16)	70,8 (12,1)	69,0 (11,9)	p<0,02
BMI (week 14-16)	24,9 (4,1)	24,1 (3,7)	p<0,001
Weight gain during pregnancy (kg)	10,6 (3,8)	10,4 (3,3)	ns
Fasting p-glucose week 14-16	4,19 (0,47)	4,46 (0,44)	p<0,001
Fasting p-glucose week 30-32	4,44 (0,49)	4,53 (0,51)	p<0,005
2 hour p-glucose week 14-16	4,42 (1,18)	4,50 (1,20)	ns
2-hour p-glucose week 30-32	6,08 (1,40)	5,95 (1,51)	ns
Birth weight (g)	3619 (570)	3556 (578)	p<0,08
GDM (%) week 14-16	1,9	1,2	ns
GDM (%) week 30-32	10.6	13.5	ns

Results: Maternal age and weight gain during pregnancy was unchanged, as well as gestational age at birth. For both periods the rate of gestational diabetes (GDM) is higher than previously reported in this region (12/1000/year). We found significant reductions in maternal body weight and BMI at inclusion, but no change in GDM rate between the cohorts.
Fasting and 1hour glucose levels increased during the study period, both in early and late pregnancy (p for trend <0.0001); however for 2 hour levels this shift was not significant between the two cohorts. The fasting and 1 hour glucose changes during OGTT occurred in spite of an unchanged GDM rate and a significant decrease in BMI at week 14-16 (p for trend <0.01).
Conclusions: This normal urban population demonstrated an unexpected high GDM rate. During longitudinal follow-up, there was in spite of decreasing BMI levels, unchanged GDM rates. The increasing dysglycemia during the study period indicates a rising level of diabetogenicity in these pregnant women.

No conflict of interest

P-1730

Association between polymorphisms in SLC30A8, CDKAL1, TCF7L2 and gestational diabetes mellitus in the Chinese population

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Aims: New genetic variants associated with susceptibility to type 2 diabetes mellitus have been discovered in recent genome-wide association studies. We aimed to examine the association between gestational diabetes mellitus (GDM) and 3 of these diabetogenic variants related to pancreatic beta cell function.
Methods: The study included 1140 unrelated Chinese pregnant women (493with GDM and 647 non-diabetic controls). We genotyped the single nucleotide polymorphisms (SNPs) rs10946398, rs9465871, rs7756992 and rs7754840 in CDKAL1; rs2466293 and rs13266634 in SLC30A8. and rs290487,rs11196205 and 11196208 in TCF7L2 by using the method of ligase detection reaction. The genotype frequencies and related phenotypes in the GDM patients were compared with those in the non-diabetic controls.

Results: Compared with controls, GDM was associated with rs13266634 (OR 1.29, 95% CI 1.07-1.54, p = 0.008) in SLC30A8; rs10946398 (OR 1.59, 95% CI 1.27-1.96, p = 0.002) in CDKAL1; and rs290487 (OR 1.23, 95% CI 1.02-1.96, p = 0.042) in TCF7L2. The risk alleles of the SNPs rs13266634 in SLC30A8; rs10946398in CDKAL1; rs290487 in TCFL2 were associated with significant decreases in the Insulin Sensitivity–Secretion Index (ISSI) calculated by insulin and blood glucose or insulin AUC during a 100 g OGTT performed at the time of diagnosis of GDM.
Discussion/conclusion: Some of the type 2 diabetes-associated genetic variants that were discovered in the recent GWA studies are also associated with GDM in Chinese; this may support the hypothesis that GDM and type 2 diabetes are two of the same entity.

No conflict of interest

P-1731

Possible role of polymorphism in GPX-1 gene in the risk of developing diabetic nephropathy in type 1 diabetes

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Introduction: Hyperglycaemia-induced superoxide overproduction seems to be the first and key event in the activation of all other pathways involved in the pathogenesis of diabetic nephropathy (DN). Glutathione peroxidase 1 (GPX-1) is one of the key enzymes in defence against oxidative stress at mitochondrial level. The aim of the study is to evaluate the effect of Pro198Leu polymorphism in GPX-1 gene on the risk of developing DN in type 1 diabetes.
Method: We studied 184 type 1 diabetic patients. They were divided into two groups: A – 91 patients with DN (proteinuria or ESRD) and B – 93 patients without microalbuminuria and more than 20 years diabetes duration. Genomic DNA was extracted from peripheral blood leucocytes using comercial Kit. Pro198Leu (rs=1050450) polymorphism was assessed by PCR followed by restriction with Apa I and electrophoresis (PAGE 8%). Association analysis was performed using DeFinetti computer program. In all cases P values < 0.05 were considered statistically significant.
Results: Hardy-Weinberg equilibrium was respected for patients with DN (F=0.19173, p=0.067406) and controls (F=0.09242, p=0.372773). At association test, homozygote patients for Pro allele had an OR=2.632 [95%C.I. (1.065-6.502), chi^2=4.56, p=0.03], the presence of one Pro allele conferred an OR=1.622 [95%C.I. (0.905-2.905), chi^2=2.66, p=0.10] for developing DN, while the presence of the homozygous Leu type variant was protective OR=0.380 [95%C.I. (0.154-0.939), chi^2=4.56, p=0.03] while the heterozygous patients for Leu allele had an OR=0.435 [95%C.I. (0.184-1.026), chi^2=3.75, p=0.05]. The allele frequency were significantly different, conferring the following ORs: OR_{Leu}= 0.607 [95%CI (0.392-0.939), chi^2=5.05, p=0.02] and OR_{Pro} = 1.648 [95%C.I. (1.064-2.552), chi^2=5.05, p=0.02].
Conclusions: Presence of the wild type - Pro variant for Pro198Leu polymorphism in GPX-1 gene may increase the risk of developing DN in Romanian type 1 diabetic patients while the mutant Leu allele seems protective. These results are very interesting because this is the first report of this polymorphism in diabetic nephropathy and allele frequencies are different from literature, which is why the results have to be confirmed in larger studies.

Conflict of interest:
Other substantive relationships: Acknowledgments: The National University Research Council PROJECTS: PNCDI – II – RU – TD – 66/2007 and PNCDI – II – RU – ID – 1194/2009 and Dinu Patriciu Foundation.

P-1732

Relationship between compliance of self-monitoring of blood glucose (SMBG) and improvement in glycemic control in patients with type 2 diabetes

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Background & aim: Self-monitoring of blood glucose (SMBG) is a useful tool for patients with diabetes to detect patterns of blood glucose control. However Japanese patients treated with oral hypoglycemic agents (OHA) usually do not perform SMBG because health insurance does not cover it. In addition, many patients treated with insulin are not willing to do SMBG frequently because of pain at blood sampling. Accordingly, SMBG is not fully applied in clinical practice. To approach this problem, we have designed a clinical research in order to examine advantageous effect that less painful blood sampling technique could improve glycemic control in patients with type 2 diabetes by increasing compliance of SMBG. In our preliminary questionnaire, 74% of 48 patients answered that palm blood sampling was less painful than fingertip one and the others answered that the pain was equal. From the result, we select two puncture sites, fingertip and palm, to evaluate glycemic control and compliance of SMBG.
Subjects & methods: A prospective, open, randomized, 24-week, single center study assesses the efficacy of SMBG on glycemic control in patients with type 2 diabetes. The study has been approved by the Institutional Review Board of Kyoto University Hospital. The primary objective is to evaluate glycemic control (reduction of HbA1c). The study has started since June 2009 and 120 patients newly treated with insulin and 180 ones treated with OHA alone are being enrolled. Insulin-treated patients are allocated to two groups; fingertip or palm, and OHA-treated patients are allocated to three groups; fingertip or palm or no SMBG, using a randomized, balanced design. Each subject is screened for eligibility, provided voluntary informed consent and basic demographic information and medical history. They also are given the One Touch Ultra Blood Glucose Monitoring System kit which allows both fingertip and palm testing. Subjects are required at minimum thrice SMBG at least three days a week in daily life and 7 times SMBG at least two days in a week before the next visit. Subjects visit every 6 weeks, and laboratory data including HbA1c and total number of SMBG are collected. They also are requested to fill in the questionnaire about SMBG at visit 3 (the first visit after the start of SMBG) and visit 6 (the final visit of the study). The study has been registered on University hospital Medical Information Network (UMIN) in Japan (UMIN000001525).
Results: Interim analysis about reduction of HbA1c and compliance of SMBG will be presented, comparing the fingertip group and the palm one in the patients treated with insulin or OHA alone. We also will report the result of the questionnaire about SMBG.

No conflict of interest

P-1733

Eye based glucose meter – correlation tests

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Aims: This study compared glucose levels measured in the anterior chamber of the eye with glucose levels measured simultaneously in venous and capillary blood. Subjects had type 2 diabetes and no known eye disease. The ultimate aim is to produce a robust, non-invasive self glucose monitoring technique for people with diabetes.
Methods: Although the final goal is an eye glucose meter with the look of a mobile phone the prototype used in this trial was 25cm x 15cm x 15cm and was mounted on an ophthalmic stage. It used an eye safe 780nm laser to interrogate the anterior chamber of the eye and had received a notice of no objection from the Medical and Healthcare products Regulatory Agency (MHRA). The trial had ethical approval from the National Research Ethics Committee (NREC).
Thirty volunteers attended for 5 hours, each on one occasion. During the first hour they had an intravenous cannula inserted and were trained on the eye meter. Over the next 4 hours measurements of eye, venous and capillary

glucose were taken every 15 minutes. Capillary glucose was measured using Roche Accu-Chek, Lifescan OneTouch and Hemocue 201+ meters. Venous glucose was collected and centrifuged for subsequent laboratory analysis in a Johnson and Johnson Vitros 5.1.

Results: A statistical analysis was performed using the software package R to compare data from the eye with that from the gold standard meter (Vitros 5.1). Due to the requirement to get precise results at low blood glucose levels – when hypoglycaemia is a risk – the analysis was performed with the log of the blood glucose.

The anterior chamber dimensions were used as the model's target rather than the log blood glucose, as this allows the absolute dimensions to be used rather than normalised values.

A mixed model was used for the statistical analysis. This allowed us to determine which parameters, obtained during the measurement process, are important. The p-value relating to the log blood glucose term was calculated to be <0.0001. A p-value of less than 0.05 demonstrates that there is a correlation between the two parameters. Therefore, this is deemed to be strong evidence that blood glucose and anterior chamber dimensions are associated.

Conclusions: The study confirms that our eye based method for non-invasive eye glucose measurement correlates closely over a wide range of values with venous glucose without an obvious time lag. The next steps are to develop a predictive algorithm, build this into a handheld version of the meter and to test the technique on people with potential interferents.

Conflict of interest:
Stock ownership: D Daly owns stock in Lein Applied Diagnostics
Employee: D Daly is an employee of Lein Applied Diagnostics

P-1734

Therapeutic potential of glucagon-like peptide-1 agonists in insulin-treated diabetes mellitus

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We have reported that the glucagon-like peptide-1 agonist exendin-4 (E4) can greatly (>50%) reduce post-prandial glycaemic excursions in C-peptide (CP)-deficient (meal-stimulated CP < 0.2 mmol) diabetes, when injected subcutaneously before breakfast with usual insulin, during intensive insulin treatment (IIT). To test the hypothesis that greater glycaemic effects of E4 would be manifest in CP-positive (meal-stimulated CP ≥ 0.4 mmol) insulin-treated diabetes, we here used the same protocol and doses of E4 with diet-conforming breakfasts and with continuing IIT in 8 volunteers, age 45 ± 6 y, $A1_c$ 7.5 ± 0.4% $A1_c$, insulin dose 0.77 ± 0.08 u/Kg/d, peak meal-stimulated CP 0.62 ± 0.27 nM, duration of diabetes 11 ± 4 y. They received usual pre-breakfast insulin, without E4 (vehicle injection), or with 3-5 doses among 0.01, 0.02, 0.04, 0.06, 0.08 µg/kg body weight (BW), on different occasions, in varied order, with masking of E4 dosage in these 40 individual studies. Self-selected breakfasts were replicated for each subject. Blood levels of glucose, CP, free immunoreactive insulin (FIRI), glucagon and human pancreatic polypeptide (HPP, reflecting humoral and/or nervous entero-insular functions) were determined at 15-30 minute intervals through 240 mins. Changes of postprandial excursions from concentrations at 0 min were dose-related for glucose, HPP, and glucagon (correlations, r > 0.9, p < 0.04, anova) with estimated dosage for 50% attainable effect ('ED 50') 0.02-0.04 µg/kg BW E4, similar to our findings in CP-deficient diabetes. No effects of E4 on CP or FIRI were discernable, and no symptomatic adverse effects occurred with E4 < 0.08 µg/kg. E4 doses > 0.02 µg/kg reduced mean incremental plasma glucose levels into the range observed in concurrent studies in 8 normal volunteers who received 75 g carbohydrate breakfasts. We conclude that systemic delivery of ED50 dose E4 can powerfully enhance glycaemic control in insulin-treated diabetes, reducing the peak increments of plasma glucose postprandially by more than 50%, with equivalent effects in subjects with and without endogenous insulin secretion. This was demonstrated by means analogous to those employed in the original studies that defined insulin sensitivity in insulin-treated diabetes. Taken with the results in CP-deficient diabetes, the observations also show that portal delivery of endogenous insulin in low-normal amounts does not contribute detectably to observed effects on the glycaemic response. These observations indicate the need for, and enable, studies to assess the therapeutic potential of GLP-1 agonists as congeners with insulin for attainment of improved glycaemic control without adverse effect, and with possible reduction of insulin dosage, in people with insulin-requiring Type 1 or Type 2 diabetes.

No conflict of interest

P-1735

Effect of the dual endothelin receptor antagonist, bosentan, on untreatable ulcers in a diabetic patient

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Aims: Refractory skin ulcers are a major burden in diabetic patients. Their pathogenesis is multifactorial and increasing data implicate endothelin as a mediator of diabetic macrovasculopathy and microvasculopathy. We report here the resolution of refractory skin ulcers in a patient treated with the dual endothelin receptor antagonist bosentan.

Methods: An 85-year-old male with 30-year history of type 2 diabetes developed an ulcer on his right heel in November 2007 after prolonged heat exposure. Despite appropriate care, the ulcer increased in size and within 3 months the patient was unable to walk. He was admitted to hospital for congestive heart failure one month later. At time of admission, skin examination showed the heel ulcer to be extensive and in Wagner Grade III. It had evolved to expose the calcaneus, with an inflammatory aspect, limited granulation tissue, and a purulent, fetid exudate. The patient had also developed three Grade II decubital lesions on the sacral area, external malleolus and flexure of the right ankle. These were well delineated, of necrotic appearance, without granulation tissue and with purulent exudates. General examination showed congestive heart failure. The patient's diabetes remained well controlled. Standard therapy comprising mechanical and enzymatic debridement with aqueous gel dressing, combined with pentoxifylline 1,200 mg/day was administered during the next 5 months. Ciprofloxacin, followed by clavulanic acid plus amoxicillin, was also administered for 15 days during this time. The patient's response to this therapy was, however, disappointing. The heel ulcer remained in Grade III, affecting the total posterior face, with partial exposure of the calcaneus but sparing the Achilles tendon. The three decubital lesions remained in Grade II. In parallel, his general condition deteriorated. After this time he was treated with bosentan 62.5 mg/day for one week, up-titrated to 62.5 mg b.i.d thereafter, on a compassionate use basis.

Results: After 3 weeks of bosentan treatment the sacral ulcer rapidly healed, followed by the external malleolar ulcer. Marked granulation tissue became apparent on the heel and ankle ulcers. Following 21 weeks of bosentan treatment, all ulcers had healed and the patient was able to walk with assistance. No abnormalities were observed during monitoring of blood pressure, erythrocyte count, or alanine and aspartate aminotransferases, during bosentan treatment.

Discussion: This single case of an apparent beneficial effect and good tolerance of bosentan in a diabetic patient with refractory skin ulcers should be interpreted with care and merits further investigation. If confirmed, this observation would support a role of endothelin in the pathogenesis of diabetic skin ulcerations.

No conflict of interest

P-1736

Factors accounting for variability in weight and HbA1c response to exenatide in the Association of British Clinical Diabetologists (ABCD) nationwide exenatide audit

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Aims: To learn from experience of exenatide in real clinical use in the UK, ABCD began a nationwide audit in December 2008.

Methods: An on-line questionnaire in a password protected area of the ABCD website for collection of anonymised patient data. UK diabetologists were persistently prompted by email to contribute.

Results: The first 3913 patients with data available for analysis were studied - mean (+/- SD) age 54.6 (+/-10.4) years, 2167/3913 (55.4%) male. In response to exenatide, mean (+/- SD) HbA1c, weight and body mass index fell as follows: HbA1c by 0.75% from 9.42 (+/- 1.19)% to 8.65 (+/- 1.22)% ($p<10^{-126}$), weight by 4.9kg from 114 (+/- 23.3) to 109.1 (+/- 22.6) kg ($p<10^{-}$

[15]), BMI by 1.74 from 39.89 (+/- 7.5) to 38.15 (+/-7.24) kg/m^2 ($p<10^{-16}$). The weight and HbA1c response showed considerable variability; to assess factors accounting for this variability, weight and HbA1c responses were each divided into 5 groupings. 5 weight groupings: weight increase; weight loss of 0-2Kg, 2-5Kg, 5-10Kg and >10Kg respectively. 5 HbA1c groupings: HbA1c rise >1% and 0-1%; HbA1c fall 0-1%, 1-2%, and >2% respectively. These groups were compared by analysis of variance with regard to initial HbA1c, weight, BMI, duration of diabetes, age, sex, insulin usage prior to exenatide and insulin discontinuation at exenatide start. Highly significant differences were found between the groups:

- Those whose weight increased after exenatide had higher initial HbA1c, but lower initial weight, BMI and age. They were less likely either 1) to have been on insulin or 2) to have had insulin stopped.
- Those who lost a large amount of weight (>10kg) after exenatide had a lower initial HbA1c, higher initial weight and BMI, and slightly longer duration diabetes. They were more likely 1) to have been on insulin 2) to have had insulin stopped.
- Those with the greatest falls in HbA1c after exenatide (>2%) had higher initial HbA1c.
- Those who experienced the greatest rise in HbA1c after exenatide (>1%) had a higher initial weight, were also more likely to be on insulin before being started on exenatide; when insulin was stopped at exenatide start, those whose HbA1c rose were more likely to have insulin restarted.

Conclusion:

1. Heavier patients with better glycaemic control lose the greatest amounts of weight on exenatide.
2. Some poorly controlled patients initially put on weight with exenatide as exenatide improves glycaemic control in patients whose weight has been lowered by poor glycaemic control.
3. Strict adherence to the current exenatide license in the UK, with discontinuation of insulin at exenatide start, may lead to considerable worsening of glycaemic control. This is more likely to occur in heavy patients whose diabetes is relatively well controlled by insulin.

Conflict of interest:
Paid lecturing: Drs Ryder, Walton and Winocour have all been paid for lectures by various companies including Eli Lilly. Dr Walton no longer takes such payments
Advisory board: Drs Ryder, Walton and Winocour have attended advisory boards for various companies, including Eli Lilly. Dr Walton no longer takes such payments.
Commercially-sponsored research: Eli Lily provided ABCD with a grant to facilitate the audit.

P-1737

Teneligliptin, a novel DPP-IV inhibitor, improves glucose intolerance and prevents diet-induced adiposity in obese animal models

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Background and aims: Dipeptidyl peptidase IV (DPP-IV) inhibitors improve abnormal glucose metabolism in type 2 diabetes by increasing the life-span of incretin hormones. DPP-IV knockout mice are characterized by lack of diet-induced obesity, enhanced energy expenditure and improved insulin sensitivity. However, the effect of currently available DPP-IV inhibitors on body weight is neutral. Teneligliptin (MP-513) is a novel chemotype DPP-IV inhibitor and is now under clinical development for the treatment of type 2 diabetes. The present studies were conducted to clarify the in vitro and in vivo pharmacological profiles of teneligliptin and anti-obesity potential in high-fat diet-induced obese mice.
Methods: The in vitro effect of teneligliptin was determined using recombinant human DPP-IV (rhDPP-IV). The plasma DPP-IV activity was evaluated in Wistar rats in vivo and the effect on postprandial hyperglycemia was examined in Zucker fatty rats. To assess the anti-obesity action, teneligliptin was administered to 60% kcal-fat-fed C57BL mice (DIO mice) via drinking water for 10 weeks and the mesenteric fat was pathologically examined.
Results: The enzyme activity of rhDPP-IV was inhibited by teneligliptin in a competitive manner with a Ki value of 0.4 nmol/L. In terms of IC50 values, teneligliptin is about 7 and 2.5 times more potent than sitagliptin and saxagliptin, respectively. In vivo, the plasma DPP-IV activity was persistently and potently suppressed by the teneligliptin-treatment compared to sitagliptin-treatment with an EC50 of 0.18 mg/kg in normal rats. Single oral dosing of 0.3 and 3 mg/kg elicited more than 50% inhibition of the plasma DPP-IV activity up to 15 hours, and improved glucose intolerance with increased insulin and active GLP-1 levels in plasma in the 12-hour interval carbohydrate loading tests of Zucker fatty rats. The 10-week treatment with teneligliptin inhibited the plasma DPP-IV activity by 65% throughout the study and increased the plasma GLP-1 levels by 4.1-fold in DIO mice. The body weight gain and visceral fat mass were significantly reduced by 36% and 41%, respectively (both $p<0.01$). The plasma insulin level was reduced by 41 % and pathological examination revealed suppression of the high-fat diet-induced adipocyte hypertrophy.
Conclusion: These results indicate that teneligliptin has a potential to be a once-daily DPP-IV inhibitor. Clinical studies have already demonstrated a long-lasting DPP-IV inhibition and improvement of HbA1c in patients with type 2 diabetes. The impact on visceral adiposity makes teneligliptin likely as a next generation DPP-IV inhibitor with beyond glucose benefits.

Conflict of interest:
Employee: S.Ishii, Y.Takashina, K.Yoshida, T.Hatano, Y.Horai, A.Fukunari and K.Sakai:
Employee of Mitsubishi Tanabe Pharma Co.

P-1738

YH9425, a novel glucokinase activator with blood glucose-lowering activities in animal models

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Aims: Glucokinase (GK) activator is expected to be associated with a dual mechanism for lowering blood glucose concentration – enhancement of insulin secretion from pancreatic beta-cell and glucose uptake in the liver. For new anti-diabetes agent, we discovered a novel GK activator, YH9425, and evaluated the mode of action in-vitro and the glucose lowering potential in animal models.
Methods: An enzymatic GK assay using purified recombinant human pancreatic and liver GK was used to evaluate the effect of YH9425. Selectivity against hexokinase 1 and 2 was tested also using enzymatic HK 1 and 2 assays.
Min6 cells, mouse pancreatic beta-cell line, were used for glucose dependent insulin secretion.
We examined the change of basal blood glucose levels and oral glucose tolerance (OGT) in non-diabetic (C57BL/J6) and diabetic (db/db) mouse model after oral administration. The level of blood glucose, HbA1c and OGT were measured in ob/ob mice after 2 weeks of once daily oral dosing.
Results: YH9425 raised human pancreatic GK activity (half maximum effective concentration-EC_{50} of 48.9 nM at 5 mM glucose) with a half maximum saturation concentration ($S_{0.5}$) of 1.36 mM glucose and maximum reaction rate (V_{max}) of 117 %. It activated human hepatic GK with an EC_{50} of 54.3 nM, same as pancreatic GK, and did not affect the hexokinase 1 and 2.
This compound increased insulin secretion from Min6 cells in a glucose dependent manner.
YH9425 also improved a dose-response OGT in C57Bl/J6 mice; for dosing 5, 15 and 50 mg/kg, area under the curve of blood glucose was decreased of 9, 26 and 38 %. Acute treatment of the compound in C57Bl/J6 and db/db mice elicited basal glucose lowering activity. In 14 day sub-chronic study with ob/ob mice, YH9425 showed significant decrease in HbA1c and blood glucose levels and no adverse effects on serum lipids or body weight have been observed.
Conclusions: YH9425 has potential as a therapeutic agent for type 2 diabetes mellitus. Currently, we are studying YH9425 and its analog.

No conflict of interest

P-1739

Improvement in glycemic control after 12 week treatment with melogliptin, a novel DPP-IV inhibitor

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Aims: Melogliptin is a novel, potent, selective, oral DPP-IV inhibitor. The primary aim of this study was to determine the change from baseline in HbA1c after 12 weeks of treatment with different doses/regimens of melogliptin. Secondary aims included safety and tolerability, and changes in metabolic parameters, including β-cell function.
Methods: This was a randomized, double blind, parallel group, placebo controlled study. The study consisted of an 8 week wash out period (including a 2 week placebo run in period), followed by 12 weeks of treatment. Patients satisfying eligibility criteria (HbA1c ≥7 ≤10%), were randomised to 1 of 5 treatment arms (ie melogliptin 25mg OD, 50mg OD, 50mg BD, 100mg OD or placebo). The study had 90% power to detect a treatment difference in HbA1c of 0.45%, assuming a SD of 0.9%, and α ≤5%.
Results: A total of 494 patients with type 2 diabetes mellitus [mean age 51 years (range 30-80 years), mean diabetes duration 2.8 ± 3.6 years] were enrolled in the study. A total of 41% patients were previously treated with diet and exercise alone, whilst 59% had been taking oral anti-diabetic monotherapy.
Significant reduction in HbA1c compared to placebo was observed in all melogliptin treatment groups [ie 0.55% (p<0.0001), 0.36% (p=0.0086), 0.75% (p<0.0001), 0.6% (p<0.0001) in the 25mg OD, 50mg OD, 50mg BD, 100mg OD groups respectively]. In the subgroup of patients with a higher baseline HbA1c of 8.5-10%, melogliptin showed mean placebo-subtracted reductions in HbA1c of 1.05% and 0.88% in the 50mg BD and 100mg OD groups respectively.
Significant improvement in homeostasis model assessment-ß cell function (HOMA-ß) was also seen in the 50mg BD group relative to placebo (p=0.004). Melogliptin exhibited a good safety and tolerability profile, with only two episodes of possibly drug related hypoglycemia throughout the 12 weeks of treatment and no drug related serious adverse events.
Conclusion: This 12 week placebo controlled study demonstrates that melogliptin is a safe and effective treatment for patients with type 2 diabetes at doses ranging from 25mg to 100mg, with a therapeutic index which compares favorably with other approved DPP-IV inhibitors.

Conflict of interest:
Stock ownership: J. Efthimiou, M. Patekar, N. Maharaj
Employee: J. Efthimiou, M. Patekar, N. Maharaj
Commercially-sponsored research: S. Kalra, P.V. Rao

P-1740

Initial combination therapy with sitagliptin and pioglitazone: complementary effects on post-prandial glucose and islet cell function

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The mechanism of action, efficacy and safety of sitagliptin 100mg (SITA) and pioglitazone 30mg (PIO) were assessed in patients (pts) with type 2 diabetes mellitus. Following a 6-week diet/exercise period (and washout if discontinuing an antihyperglycemic agent), pts with fasting plasma glucose of 7.2-14.4 mmol/L entered a 2-week, single-blind, placebo run-in period. Pts (N=211) were randomized (1:1:1:1) to SITA, PIO, SITA+PIO, or placebo (PBO). At baseline and after 12 weeks, pts were given a mixed meal and underwent frequent blood sampling for measurements of glucose, insulin, and C-peptide over 5 hours (h) and glucagon over 3 h. Disposition Index (DI, a quantitative measure of the relationship between b-cell function and insulin sensitivity), Φ_s (a measure of b-cell responsiveness to above-basal glucose concentrations) and insulin sensitivity (using a validated composite index, ISI) were also assessed.

see table 1

LS-mean differences in change from baseline were assessed at Week 12.
The 5-h total glucose AUC was lower with SITA, PIO, and SITA+PIO compared to PBO (p<0.001) and was lower with SITA+PIO compared to either monotherapy (p<0.01). The 5-h total insulin AUC was greater with SITA compared to PBO (p=0.005), PIO (p<0.001), and SITA+PIO (p<0.05); SITA+PIO increased insulin AUC more than PIO (p<0.05). SITA lowered 3-h total glucagon AUC more than PBO (p=0.002), and SITA+PIO reduced glucagon AUC more than PIO (p=0.01) and PBO (p<0.001) but not compared to SITA. DI was improved from baseline with all active treatments compared to PBO (p<0.02). Both monotherapy treatments improved Φ_s from baseline compared to PBO (p<0.05) and the combination SITA+PIO improved Φ_s more than SITA (p<0.05) or PIO (p<0.001). PIO, either alone or in combination with SITA, improved ISI compared to SITA (p<0.005) and to PBO (p<0.001). All treatment regimens were generally well tolerated. Through complementary mechanisms of action the combination of SITA+PIO reduced post-prandial glucose after a mixed meal more than either treatment alone. Both agents appear to enhance beta-cell function, whereas SITA additionally improves alpha-cell function.

Conflict of interest:
Paid lecturing: Ahren, B. - Novartis, Merck, Roche, GSK, Lilly Inzucchi, S.E. - Merck, Novo Nordisk
Stock ownership: Alba, M., Guan, Y., Mallick, M., Xu, L., O'Neill, E.A., Williams-Herman, D.E., Kaufman, K.D., Goldstein, B.J. - Merck
Advisory board: Ahren, B. - Novartis, Roche, GSK, Novo Nordisk, Astra Zeneca, Sanofi Aventis Inzucchi, S.E. - Merck, Takeda, Novartis, Amylin, Daiichi-Sankyo
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Commercially-sponsored research: Ahren, B. - Novo Nordisk, Novartis, Merck Inzucchi, S.E. - Lilly
Other substantive relationships: Ahren, B. - Novo Nordisk Inzucchi, S.E. - Takeda

Table 1

Treatment	Change from Baseline at Week 12 - LS Mean (95% CI)					
	5-h total glucose AUC (mg·hr/dL)	5-h total insulin AUC (microIU·hr/mL)	3-h total glucagon AUC (pg.hr/mL)	% DI (10^{-9} min^{-1})	% Φ_s (10^{-9} min^{-1})	% ISI
SITA	-209.8 (-281.6, -138)	74.5 (38.1, 110.9)	-17.2 (-30.1, -4.2)	33.2 (5.2, 68.8)	71.5 (46.8, 100.3)	-0.8 (-13.3, 13.6)
PIO	-245.6 (-316.6, -174.6)	-38.1 (-74.8, -1.3)	-4.9 (-18.1, 8.3)	60.0 (28.0, 100.0)	27.0 (7.8, 49.7)	47.5 (28.5, 69.1)
SITA+ PIO	-389.2 (-463.6, -314.7)	18.1 (-20.8, 57.0)	-29.8 (-43.6, -16.1)	47.4 (13.0, 92.5)	125.2 (87.2, 171.0)	34.2 (14.8, 56.9)
PBO	18.6 (-58.2, 95.4)	-0.7 (-39.0, 37.6)	12.5 (-1.9, 26.9)	-11.5 (-30.6, 12.9)	-2.3 (-17.4, 15.5)	-8.8 (-21.5, 6.0)

Effect of yoga, diaphragmatic breathing,antioxidant rich diet on glycemic control, blood pressure control, anthropometry and oxidative stress: a randomised controlled trial in comparison with standard care in type 2 diabetes

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Oxidative stress is implicated in the pathogenesis of diabetes, beta cell dysfunction and complications Novel drugs are under development for inhibition of oxidative stress in Type 2 diabetes. Lifestyle interventions such as yoga are found to be beneficial in reducing oxidative stress. However controlled clinical trials are lacking. Similarly controversy exists on the role of antioxidants in diabetes.

Hence we aimed to study the effect of 3 different lifestyle interventions such as Yoga, diaphragmatic breathing (D.B.) and diet rich in antioxidants on HbA1c, blood pressure, anthropometry, oxidative stress and antioxidants.

Methods: 240 Type 2 diabetics were enrolled of which 60 had microvascular disease, 60 had macrovascular disease and 60 had neuropathy and 60 had no complications. Baseline assessment was done for all which included, FPG, PPG, HbA1c, Fasting lipid profile, BMI, waist-hip ratio, malondialdehyde (MDA) levels, Vitamin C, Vitamin E and SOD level. These patients were stratified according to complications and randomized in blocks of 12 to receive either Yoga, diaphragmatic breathing, diet rich in antioxidants, or standard care. All the three intervention groups also received standard care. Drug treatment, diet and exercise were kept constant throughout the study period. Supervised interventions were continued for 3 months and all the baseline parameters were repeated.

Results: There was no significant difference in the baseline characteristics of the four different groups. Yoga improved BMI (P=<.001),FPG (P=<.05), PPG (P=<.005),Systolic B.P. (P=<.05)and diastolic B.P. (P=<.05). D.B. improved Waist Hip ratio (P<.005,FPG (P<.005) and PPG. (P<.05). Antioxidant rich diet improved Systolic blood pressure (P<.005),FPG (P<.001) and PPG (P<.001), while with standard care there was significant increase in BMI (P<.005) and marginal decrease in waist circumference (P<.05) and increase in HbA1c (P<.005). Yoga and D.B. decreased MDA levels and oxidative stress significantly (P<.001) while diet rich in antioxidants decreased MDA levels (P<.005) and increased Vitamin C levels (P<.001), while standard care did not improve MDA or vitamin C.

Table showing Mean % difference ± S.D for groups

Intervention groups	BMI	WHR	HbA1c
Yoga	1.95 ± 2.88	1.36±5.56	0.65±16.06
D. breathing	0.42±3.3	1.66±3.48	1.77±10.03
Antioxidant diet	0.37±1.88	0.02±2.11	3.9±4.91
Standard Care	0.77±2.02	0.62±4.41	7.09±14.78
Significance (P)	<.005	<.005	<.005

Table showing Mean % difference for Oxidative Stress

Intervention groups	MDA	Vitamin C levels
Yoga	18.79±17.3	56.76±157.27
D. breathing	20.58±14.24	44.45±11.94
Antioxidant diet	5.05±11.85	63.55±80.74
Standard Care	3.72±15.3	9.79±56.14
P	<.001 <.005	

Yoga controlled BMI better while D.B improved WHR better while HbA1c improved better with antioxidant rich diet. Both Yoga and D.B improved oxidative stress better than antioxidant rich diet while antioxidants increased better with antioxidant rich diet

Conclusions: Yoga, D. breathing and antioxidant rich diet improved one or the other parameters of glycemic control, blood pressure and anthropometry and oxidative stress/antioxidants. It is useful to combine these multiple interventions as a part of life style modification in type 2 diabetes

No conflict of interest

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International
Diabetes
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