

Volume 22 Number 2

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Type 2 diabetes mellitus and thyroid dysfunction

The Melbourne Declaration on Diabetes

Family history as a risk for early-onset type 2 diabetes in Kenyan patients

Hyperglycaemic emergencies in pregnancy

Difficulties with diabetes education

Mash RJ, Rhode H, Zwarenstein M, et al. Effectiveness of a group diabetes education programme in underserved communities in South Africa: a pragmatic cluster randomised controlled trial. *Diabetic Medicine* 2014; 31: 987–993

Education of diabetic patients about their disease and its management is an accepted part of diabetes care. The literature supporting this approach is very scarce in Africa, and this report from South Africa is of a large randomised controlled trial (RCT) of educational intervention in type 2 diabetes. The study took place in community health clinics in resource-limited areas near to Capetown. There were 17 control clinics with 860 patients, which delivered standard diabetes care. At other different 17 intervention sites (710 patients), there was additional educational input. This consisted of four separate sessions of 1 hour's duration, led by trained 'health promoters'. Patients were all followed for 12-months post-intervention. Parameters measured at baseline and 12 months included blood pressure (BP), body mass index (BMI), glycated haemoglobin (HbA1c), as well as questionnaire scores of self-care activities, quality of life and locus of control. The results were disappointing – apart from a small but just significant ($p=0.04$) fall in BP, the intervention group showed no improvement in other measurements. There was a high failure to attend rate – 59% of intervention patients did not come to any of the four sessions. The group leaders also reported that finding suitable rooms or space for the sessions was often very difficult. The authors of this report acknowledge that the negative results were far from encouraging. Health clinics in Africa need to find dedicated space for group sessions – not just for diabetes, but for other conditions such as HIV, TB, hypertension, and asthma. One also wonders if the outcomes may have been better if the education had been delivered by senior nurses from the patient's own clinic.

Metformin and sleep

Kajbaf F, Fendri S, Basille-Fantinato A, et al. The relationship between metformin therapy and sleep quantity and quality in patients with type 2 diabetes referred for potential sleep disorders. *Diabetic Medicine* 2014; 31: 577–580

Metformin is undoubtedly the key drug for type 2 diabetes (T2DM). The United Kingdom Prospective Diabetes Study (UKPDS) showed that it reduces complications and mortality. Further analysis demonstrated that it was effective in normal-weight as well as over-weight patients. Some now believe that all patients diagnosed with T2DM should go straight onto metformin. This recent paper from French researchers suggests that the drug may also improve quantity and quality of sleep. Disorders of sleep such as obstructive sleep apnoea (OSA) are known to be related to insulin resistance. The authors postulated that as metformin increases insulin sensitivity, it may indirectly improve sleep in susceptible patients. They studied 387 patients referred with possible OSA, all of whom had T2DM. Sleep time and efficiency were measured. Sleep efficiency was the proportion of time 'asleep' when the patient was actually sleeping, by EEG (electroencephalogram) criteria.

Both sleep time ($p=0.002$) and efficiency ($p=0.003$) were better in those treated with metformin, even though those on metformin had a higher body mass index (BMI) – a known risk factor for OSA. This is a fascinating study, but we are certainly not at the stage where we should take a metformin pill at bed time for a good night's sleep!

Alcohol and type 2 diabetes

Blomster JI, Zoungas S, Chalmers JH, et al. The relationship between alcohol consumption and vascular complications and mortality in individuals with type 2 diabetes. *Diabetes Care* 2014; 37: 1353–1359

The possible health benefits of moderate alcohol ingestion have been debated for a long time. This paper looks at the issue in relation to patients with type 2 diabetes (T2DM), using data from a recent large outcome study ('ADVANCE') carried out in 20 countries. A total of 11 140 patients were followed for 5 years, during which time 9% died, 10% experienced a cardiovascular event, and 10% had a microvascular complication. Outcome was compared with self-reported alcohol consumption. Both the type of alcoholic drink and units of alcohol per week were recorded. Heavy consumption was defined as >21 units/week for men and >14 units/week for women. Moderate consumption was anything below these figures. The analysis showed that compared to non-drinkers, moderate consumers had less cardiovascular events ($p=0.008$), less microvascular complications ($p=0.03$), and lower all-cause mortality ($p=0.05$). Predominantly wine drinkers showed a particularly protective effect. High alcohol consumers, however, had dose-dependent higher risks of cardiovascular events and mortality. This study therefore shows a 'U-shaped' curve of alcohol consumption compared with mortality and morbidity in T2DM. The mechanism for the findings are uncertain, and the authors point out that a causal relationship is unproven, and potential benefits must be weighed against detrimental effects.

TB screening in diabetic patients

Mtwangambate G, Kalluvya SE, Kidenya BR, et al. 'Cough-triggered' tuberculosis screening among adults with diabetes in Tanzania. *Diabetic Medicine* 2014; 31: 600–605

The increased risk for tuberculosis (TB) amongst diabetic patients has been known for some time, but only recently has there been an interest in what has become known as 'bidirectional screening'. This is screening diabetic patients for TB, and screening TB patients for diabetes. Though both strategies sound sensible, there is a lack of supporting data. This study from Tanzania has examined a 'cough-triggered' strategy for TB screening amongst diabetic patients. Of 693 diabetic patients studied, 121 (18%) had cough. If the cough was non-productive, more intensive symptom screening was undertaken, and more intensive investigation undertaken if indicated. Those with productive cough had sputum microscopy and culture, and sputum-negative subjects had a chest x-ray performed. Overall, 9 new cases of TB were found, which represents an incidence 7 times the Tanzanian national average. The authors of this paper concluded that TB screening amongst African diabetic patients is worthwhile, and that their method is simple and low cost.

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Editorial

The second Diabetes Attitudes Wishes and Needs (DAWN2) Study: relevance to sub-Saharan

The second Diabetes Attitudes Wishes and Needs (DAWN2) study recently reported on the perceptions of people with diabetes, family members of people with diabetes, and healthcare professionals from 17 countries across the world. This extensive data set has built upon results from the DAWN study, conducted a decade ago. While no sub-Saharan state is included in DAWN2 participating nations, the study has involved many countries with social cultural and economic similarities. Algeria, from north Africa; India and Mexico, both emerging economies with strong socio-cultural ethos; and Turkey, a Middle Eastern neighbor, have contributed to the DAWN2 subject population.¹ DAWN2, therefore, holds equal relevance for sub-Saharan diabetes care, as it does for the rest of the world.

DAWN2 highlights the need for person-centred diabetes care, and active family involvement, patient-provider communication, and ongoing healthcare professional training. These results resonate with the ground reality of diabetes care in sub-Saharan Africa. Recent articles in the *AJDM* also point to the importance of this aspect of diabetes.²

DAWN2 documents the suboptimal involvement of people with diabetes in their self-management, and family members in support. More importantly, it highlights the strong wishes of all stakeholders for more active involvement in diabetes care.

People with diabetes expect more person-centre care from healthcare professionals. Healthcare professionals are more than willing to seek post-graduate training in various aspects of diabetes care to shoulder greater responsibility for self-management.

An important point noted by DAWN2 relates to the availability, utilisation, and perceived quality of diabetes education. Relatively few people with diabetes and their family members utilise available diabetes education facilities, and even fewer find them useful. This reinforces the need to create socio-culturally relevant and acceptable interventions for diabetes education, involving people with diabetes and family members as active participants in their development.

DAWN2 provides much needed evidence to support calls for a person-centric, and family-oriented diabetes care in Africa.

Sanjay Karla.

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mDiabetes programme: Mobile technologies are catalysts for development in Senegal

French global telecommunications equipment company Alcatel-Lucent is supporting the Senegalese government, represented by the Minister of Health and Social Action, the Minister of Communication and Digital Economy, and local partners by participating in the mDiabetes programme launched by the World Health Organization (WHO) and the International Telecommunications Union (ITU) as part of the 'Be Healthy, Be Mobile' initiative.

The mDiabetes project in Senegal is one of the larger mHealth projects Alcatel-Lucent is involved in. It aims at combating diabetes with an ambitious and innovative campaign based on mobile technology, designed to improve prevention by raising awareness among diabetic patients as well as training health professionals. SMS messages as well as applications will be used as tools in the campaign.

'Senegal is ready for this mDiabetes project which is in a way a natural extension of the eDiabetes programme developed by Université Numérique Francophone Mondiale (UNFM). Since 2009, it has helped to establish strong ties of cooperation between France and Senegal around diabetes and new technologies,' said Dr Kleinebreil, Vice-President of the UNFM.

This project is a multiple partnership involving many major stakeholders such as the Senegalese government (Ministry of Health and Ministry of Communication), International Telecommunications Union (ITU), WHO, Senegalese Association for the Assistance and Support of Diabetes Patients (ASSAD), the African branch of the International Diabetes Federation, the NGO UNFM, the Marc Sankalé Diabetes Centre, Alcatel-Lucent, Sonatel/Orange, BUPA (global international health insurance and services company), and Sanofi.

The Minister of Health and Social Action of Senegal, Dr. Awa Marie Coll Seck, announced during this ceremony that, 'Mobile phones offer potential that can be used for driving messages that promote health. Other mHealth projects around the globe have proven the effectiveness of using cell phones for messages about health'.

Diabetes cure? Stem cell breakthrough could spell end to daily insulin injections

A breakthrough in type-1 diabetes may result from a study showing that it is possible to make vast quantities of insulin-producing cells for patient transplants.

Scientists have for the first time managed to make hundreds of millions of mature human pancreatic cells to treat diabetic mice successfully over long periods of time. The researchers believe that human clinical trials could begin within a few years with long-term, subcutaneous implants that could make daily insulin injections redundant.

Scientists at Harvard University in Cambridge, Massachusetts, who carried out the study, said that it should be possible to produce 'scalable' quantities of beta pancreatic cells from stem cells in industrial-sized bioreactors and then transplant them into a patient within an implant to protect them from immune attack.

'A scientific breakthrough is to make functional cells that cure a diabetic mouse, but a major medical breakthrough is

to be able to manufacture at large enough scale the functional cells to treat all diabetics. This research is therefore a scientific and potentially a major medical breakthrough,' said Chris Mason, professor of regenerative medicine at University College London.

The world gets behind World Diabetes Day



The International Diabetes Federation (IDF), along with other member associations, will be holding different events across the world to celebrate the World Diabetes Day (WDD) campaign on 14th November.

WDD is a campaign that features a new theme chosen by the IDF each year to address issues facing the global diabetes community.

WDD is celebrated by the over 200 member associations of the IDF in more than 160 countries and territories, all member states of the United Nations, as well as by other associations and organisations, companies, healthcare professionals, and people living with diabetes, and their families.

Activities and events to celebrate the campaign include free diabetes screenings, walking, running and cycling events, and different events for children to get involved and learn.

Merck kicks off its second year fight against diabetes by adopting e-learning solutions to build healthcare capacity in Africa

Merck, the world's oldest pharmaceutical and chemical company has started its second year of its five year project to provide European Accredited Clinical Diabetes Management course for medical and pharmacy students in African Universities by introducing e-Learning.

The German pharmaceutical and chemical giant is implementing a well structured and coherent Corporate Social Responsibility strategy that features a medical education Africa tour to improve diabetes healthcare in Africa.

At the beginning of September 2014, Merck Capacity Advancement Programme (CAP) kicked off its second year of the Clinical Diabetes Management Programme to medical and pharmacy students in University of Nairobi. Merck will provide the same course to medical students of Makerere University, Uganda and University of Namibia.

By the end of September 2014, Merck CAP provided the same course addressing chronic diseases management focusing on diabetes and hypertension. The course will be offered in Portuguese by international and local professors to medical students at University Eduardo Mondlane, Mozambique and Katyavala Bwila University, Angola.

Dr Stefan Oschmann, Merck Pharma CEO emphasised; 'Merck is supporting e-Health which can definitely contribute to bringing healthcare to unserved or underserved populations; increasing the effectiveness and reducing the costs of healthcare delivery; improving the effectiveness of public health programmes and research; preventing illness and managing and treating chronic diseases.'

Type 2 diabetes mellitus and thyroid dysfunction: an intertwined duo

A Nicholas

Introduction

Diabetes and thyroid diseases are two common endocrinopathies seen in the general population. Diabetes is a group of aetiologically different metabolic defects characterised by hyperglycaemia resulting from defects in insulin secretion, insulin action, or both.

The World Health Organisation (WHO) has projected that the global prevalence of diabetes will rise to 300 million (7.8%) by 2030.¹ Factors such as sedentary lifestyle, dietary indiscretions, ethnicity, hypertension and obesity are thought to be major contributions to this epidemic.²

Thyroid disorders are also common, with variable prevalence among different populations. Abnormal thyroid hormone levels can also be found in individuals with diabetes. The first reports showing the association between diabetes and thyroid dysfunction were published in 1979.^{3,4} Thyroid hormones are insulin antagonists, both insulin and thyroid hormones are involved in cellular metabolism and excess and deficit of either one can result in functional derangement of the other. Studies have shown that hypothyroidism (Hashimoto's thyroiditis) or hyperthyroidism (Grave's disease) are associated with diabetes. A meta-analysis reported a prevalence of thyroid dysfunction in patients with diabetes of 11%.⁶ In chemically induced diabetic animals, the alterations in the hypothalamo-pituitary-thyroid axis include reduction in hypothalamic and plasma thyrotrophin-releasing hormone (TRH), pituitary and plasma thyroid-stimulating hormone (TSH) as well as diminished tri-iodothyronine (T3) and thyroxine (T4) production.^{7,8} Unmanaged pre-diabetes, both type 1 and type 2, may induce a 'low T3 state' characterised by low serum total and free T3 levels, increase in reverse T3 (rT3) but near-normal serum T4 and TSH concentrations.⁹ The relation between type 2 diabetes and thyroid dysfunction is an important area of research as it could give further insights into the pathophysiological processes of metabolic syndrome, atherosclerosis, and related cardiovascular disorders.

Epidemiology

The reported prevalence of thyroid disorders in the

diabetic population varies with the characteristics of the study population. A study was carried out among diabetic patients in Calabar, Nigeria for which 161 diabetic subjects and 105 non-diabetic controls were selected. The authors reported a high incidence (46.5%) of abnormal thyroid hormone levels among diabetic patients; the prevalence of hypothyroidism was higher in women than in men, while the prevalence of hyperthyroidism was higher in males.¹⁰ Similarly, Radaideh et al. in Jordan, reported a prevalence of thyroid dysfunction in type 2 diabetic patients of 12.5%.¹¹ Bal et al. in India also found a prevalence of thyroid diseases of 40.4% among 184 type 2 diabetic patients, with a positive correlation with age of patient in the thyroid dysfunction group.¹²

Pasupathi et al. investigated the effect of diabetes on thyroid hormone levels and other biochemical variables. In their study, it was found that the levels of TSH were significantly decreased, whereas the levels of T4 and free T4 (FT4) were significantly increased, in diabetic patients compared with control subjects. However, the T3 and FT4 levels did not differ significantly between groups.¹³ Islam et al. investigated thyroid hormone levels in 52 uncontrolled diabetic patients and 50 controlled subjects. They reported that patients with type 2 diabetes had significantly lower serum FT4 levels compared with the control and study subjects.¹⁴ Bazrafshan et al. in their study of 210 type 2 diabetic patients assessed the relationship between thyroid dysfunction and diabetes. The observed disorders included goiter (30%), sub-clinical hypothyroidism (13%), clinical hypothyroidism (4%), and clinical hyperthyroidism (0.5%). A significant positive correlation was observed between haemoglobin (HbA1c) concentration and TSH levels among the subjects.¹⁵

These studies further emphasise that diabetes and thyroid dysfunction are related and have common pathophysiological mechanisms, as will be explained below.

Pathophysiological correlates of thyroid disease and type 2 diabetes

Insulin resistance is a key pathological feature of type 2 diabetes and also occurs in both hypothyroidism and hyperthyroidism.¹⁶ Insulin resistance and B-cell function are inversely correlated with TSH, which may be explained by the insulin-antagonistic effects of thyroid hormones along with an increase in TSH.¹⁷ The high serum TSH corresponds to lower T₃ and T₄ levels which weakens the insulin antagonistic effects. This observation demonstrates that insulin imbalance is associated

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closely with thyroid dysfunction and is mediated via B-cell dysfunction.¹⁸

The liver muscles and fat tissues also play major roles in the inter-relationship between thyroid dysfunction and type 2 diabetes. In hyperthyroidism, endogenous glucose production is increased and this causes a reduction in insulin sensitivity in the liver¹⁹ due to glycogenesis and glycogenolysis. This effect is proposed to be mediated by glucose transporter 2 (GLUT 2) transporters in the liver which ultimately leads to elevation in plasma free fatty acids.^{19,20}

In the skeletal muscle, there is a significant increase in the utilisation of glucose in the hyperthyroid state.²¹ Hyperthyroidism has also been reported to be associated with enhanced insulin sensitivity.²² Increased peripheral insulin resistance is mediated by expression of adipokines (interleukin-6 (IL-6) and tumour necrosis factor (TNF)- α).²³ Insulin resistance has also been demonstrated in hypothyroidism in vitro and in pre-clinical studies.^{24–27} Subclinical hypothyroidism has also been reported to be associated with insulin.²⁷

The majority of the hormones secreted by the thyroid gland are largely bound to thyroid binding globulin (TBG). A smaller amount circulates in the plasma as FT₄ and FT₃. Suzuki et al in their study attributed the abnormal thyroid hormone levels found in diabetic patients to the presence of thyroid hormone binding inhibitor (THBI), an inhibitor of the extra thyroidal conversion enzyme (5-deiodinase) of T₄ to T₃, and dysfunction of the hypothalamo-pituitary-thyroid axis.²⁸ These features were observed to be aggravated by stress and poorly controlled diabetes.

Anti-diabetic therapy and thyroid dysfunction

The use of oral hypoglycaemic medications in the treatment of patients with type 2 diabetes also has varying effects on thyroid hormone homeostasis. Cappelli et al. in their study evaluated thyroid hormone profiles by studying the interaction between metformin and circulating thyroid function parameters in patients who were started on metformin. A pilot study of diabetic hypothyroid patients revealed a baseline reduction of TSH level after 6 months. Similarly, a large cohort study carried out on diabetic patients showed a significant fall in TSH level in euthyroid patients on L-T₄ substitution and subclinical hypothyroid patients who did not receive L-T₄ treatment, except in euthyroid patients after 1 year on metformin. This study concluded that the TSH-lowering effect of metformin is only seen in untreated hypothyroid patients and with L-T₄ replacement therapy irrespective of thyroid function test.^{30,31}

Insulin also has effects on thyroid hormones. It is known that insulin, an anabolic hormone, enhances the levels of FT₄ while it suppresses the level of T₃ by inhibiting the hepatic conversion of T₄ to T₃.³² On the other hand, other hypoglycaemic agents, such as phenylthiourea, are known to suppress the levels of FT₄ and T₄, while causing raised levels of TSH.^{33,34}

Detection of thyroid dysfunction in type 2 diabetes

Studies done have unequivocally stated that testing for thyroid dysfunction in type 2 diabetes patients is necessary and should be carried out annually.³⁵ The American Thyroid Association guidelines for type 2 diabetes patients require frequent testing for thyroid dysfunction.³⁵ They recommend testing at 35 years of age, and every 5 years thereafter in adults. High-risk persons may require more frequent tests. Diabetes is mentioned as a high-risk factor, but no distinction is made between type 1 and type 2 diabetes.³⁵ The American Association of Clinical Endocrinologists, Thyroid Disease Clinical Practice Guidelines (2002) recommend thyroid palpation and measurement of TSH levels in diagnosis, especially if goiter or other auto-immune disease presents in association with type 2 diabetes.³⁶ The British Thyroid Association and the Association of Clinical Biochemistry Guidelines recommend assessment of baseline thyroid function tests, TSH and antibodies for diabetic patients in pregnancy and post-partum.³⁷ For the African region, any of the above could be modified and adopted as protocols for regular screening for thyroid abnormalities in all diabetic patients, which will allow early treatment of sub-clinical thyroid dysfunction. A sensitive serum TSH assay is the screening test of choice.

Conclusion

There is growing evidence of an association between thyroid dysfunction and diabetes. Uncontrolled hyperthyroidism in diabetes may trigger hyperglycaemic emergencies while recurrent hypoglycaemic episodes have been reported in diabetic patients with hypothyroidism. Furthermore, thyroid dysfunction may amplify cardiovascular disease risk in diabetic patients though inter-relationships with dyslipidaemia, insulin resistance, and vascular endothelial dysfunction. It is therefore important to diagnose thyroid dysfunction in diabetic patients and this practice should be inculcated in clinical settings. This would encourage further understanding of the relationship between thyroid function and diabetes, thereby reducing morbidity and mortality from these conditions.

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The Melbourne Declaration on Diabetes

A Saunders

On 2nd December 2013 I attended the first meeting of the Parliamentary Diabetes Global Network (PDGN) in Melbourne, Australia. The meeting was attended by invited parliamentarians, representing 50 countries and we agreed and signed a declaration on diabetes, now known as the Melbourne Declaration.

Meeting in the Victoria State Parliament building, Members of Parliament (MPs) from across the globe reported on the state of diabetes care in their own countries, discussed how to raise the profile of the condition and agreed the declaration calling for urgent action to address the diabetes pandemic, committing the signatories to work across parliaments to help prevent the incidence of diabetes, ensure early diagnosis and improve the treatment of people with the condition.

The meeting elected two Vice-Presidents, Dr Rachael Nyamai MP (Kenya) and Simon Busuttill MP (Malta), and myself as the first President. I was invited to attend as the Chairman of the United Kingdom All Party Parliamentary Group for Diabetes and of the European Policy Action Network for Diabetes (ExPAND). I have also lived with type 1 diabetes for a quarter of a century.

There is, of course, already a great deal of cross-national communication among medical professionals, pharmaceutical companies, health ministers and patient groups. However, for a long time there was nothing that linked the parliamentarians who can actually set the agenda, influence budgets and vote for policies. That is why the Parliamentary Diabetes Global Network has been established. This, the first global network of parliamentarians for a specific medical condition, is intended to create a platform to raise the profile of diabetes within governments across the world.

Through the communication of ideas and best practice and the encouragement of action within parliaments around the world we can move towards an important tipping point, where the allocation of resources and efforts to prevent, diagnose and treat diabetes is no longer questioned. The urgency required cannot be over-stated

given the rising tide of diabetes across all continents and countries rich and poor. Already the scale of the challenge threatens the health care budgets of many countries and the economic progress of some.

There are over 382 million people with diabetes most of whom are aged between 40 and 59 years, and 80% of them live in low- and middle-income countries. All types of diabetes are on the increase, type 2 diabetes in particular: the number of people with diabetes will increase by 55% by 2035. An additional 21 million cases of high blood glucose in pregnancy are estimated to contribute to the global burden of diabetes. That is equivalent to 17% of live births to women in 2013 that had some form of high blood glucose in pregnancy.

In human as well as financial terms, the burden of diabetes is enormous, leading to 5.1 million deaths and consuming some 548 billion US dollars in health spending. This equals 11% of the total world-wide health spending in 2013.

However, the growing prevalence of diabetes is particularly marked in middle and low-income countries. They face specific pressing issues such as malnutrition, environmental change, rapid urban development, changes in diet and progress is hampered by poor healthcare systems and funding shortages.

As the number of people with diabetes in middle and low-income countries grows, the importance of the group will also grow. By functioning as a forum for parliamentarians from around the globe to share ideas, knowledge and experiences from their own countries, it will serve to help countries that are less well-prepared to tackle the increasing prevalence of diabetes. The opportunity to discuss these issues with parliamentarians who have experienced similar changes in recent years will be one of the great benefits of the network.

Nevertheless, the diabetes pandemic remains a global one. Our priority in the early years will be to build a coalition of advocates for action to tackle the pandemic at local, regional, national and trans-national level. The network will focus on raising the matter in parliaments and assemblies across the globe in order to spread better understanding and awareness of diabetes and the urgency with which it needs to be addressed.

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House of Commons, London, SW1A 0AA, UK.*

Below is the declaration signed on 2nd December 2013 in Melbourne, Australia, now known as the 'Melbourne Declaration on Diabetes'. This was made by a group of international Members of Parliament known as the 'Parliamentary Champions for Diabetes Forum'.

We commit ourselves to working across Parliaments with all who have a special interest in diabetes and hereby agree to establish a 'Parliamentarians for Diabetes' global network with the following objectives to:

1. Exchange policy views and practical initiatives of relevance and to hear from experts on opportunities for action and progress in the prevention and management of diabetes. To always strive for 'best practice', and advocate for people with diabetes, their families and carers, and those at risk and to become a powerful force internationally to respond in a coordinated and focussed way to the diabetes pandemic and to promote the diabetes cause.
2. Provide parliamentarians with the opportunity to attend meetings organised by the IDF and their Member Associations, aiming to improve health outcomes for people with diabetes, stop discrimination towards people with diabetes and prevent development of type 2 diabetes. A special focus should be the different regions of the globe to ensure practical solutions are offered.
3. Establish a platform for the dialogue between IDF Member Associations and other stakeholders to exchange information and discuss special areas of common interest. These will include prevention, workforce, costs of diabetes, access to medicines, and effective strategies to combat and manage the pandemic. To report back to ministers, parliamentarians and other key decision-makers in our home countries and to seek commitments to deliver on the targets set at the 66th WHA in 2013. The global network will support the sharing of resources such as research, legislative initiatives, prevention campaigns and joint initiatives relevant to the various regions of the globe.
4. Encourage all governments to acknowledge that diabetes is a national health priority that requires a comprehensive action plan leading to action.
5. Respond to and participate in relevant debate and discussion on and related to the World Health Assembly, World Health Organization, United Nations and other appropriate organisations or government bodies and specifically to ensure the inclusion of diabetes and NCDs in the post-2015 development framework noting this framework should be aligned with the goals and targets on diabetes agreed at the 66th WHA. Diabetes intersects all major dimensions of global development, including poverty reduction, gender inequality, education, environmental sustainability and infectious diseases.
6. Confer honour and express gratitude to those Members of Parliament supporting the diabetes cause, wherever they may be and to use our best endeavours to recruit other Members of Parliament for this purpose.
7. Create opportunities for networking and building relationships between Members of Parliament, other key decision-makers, the IDF and its Member Associations and others. To hold meetings in various regions of the globe as agreed, and to meet again as a Global Forum at the next World Diabetes Congress in 2015.
8. Appoint a global co-ordinator with appropriate administrative and management support to assist the global network to achieve the above objectives.

Non-medical management practices for type 2 diabetes in a teaching hospital in southern Nigeria

A R Isara, L Omonigho and D O Olaoye

Abstract

The aim of this study was to assess the practices of non-medical management of diabetes mellitus by type 2 diabetes patients attending the diabetic clinic of the University of Benin Teaching Hospital, Benin City, Nigeria. A descriptive cross-sectional study was carried out among type 2 diabetes outpatients. The respondents were recruited consecutively from the consultant outpatient clinic of the hospital. Data were collected using a structured questionnaire and 216 were investigated (44% male, mean (\pm SD) age 60+9 years). A high proportion (41%) had secondary education, 45% were skilled workers, and 35% earned 31 000–60 000 Naira (US\$150–\$350) monthly. All respondents admitted receiving regular education on self-care management during clinic visits. Blood glucose checks were done weekly by 16% and monthly by 81%. However, only 47% possessed their own glucose meter. The majority (76%) adhered to a planned diet regimen, 60% exercised regularly, 93% checked their weight monthly, and 71% checked their blood pressure monthly. The type 2 diabetes patients were generally aware of the non-medical management of diabetes and their practice of it was fair. Statistically significant correlations were found between dietary adherence and increased diabetes duration ($p=0.011$). Regular exercise was more common in older ($p=0.003$) and better educated ($p=0.007$) patients. Possession of a glucose meter was, as expected, associated with higher education ($p=0.00002$) and monthly income ($p=0.0001$). There is a need for continuous promotion of these non-medical management practices and healthy lifestyles among type 2 diabetic patients whenever they come in contact with healthcare delivery systems.

Introduction

Diabetes mellitus contributes significantly to medical morbidity and mortality worldwide, especially in developing countries like Nigeria. It is estimated that 347 million people worldwide have diabetes.¹ In 2004, an estimated 3.4 million people died from the consequences of high fasting blood glucose,^{2,3} with more than 80% of these deaths occurring in the low- and medium-income countries of the world.⁴ A similar number of deaths were estimated for 2010.³ In the World Health Organization (WHO) African region in 2011, an estimated 14.7 million adults were suffering from diabetes which resulted in 344 000 deaths and nearly 2.8 billion dollars was spent on the disease by countries in the region.⁵

Studies in Nigeria have reported that the prevalence of diabetes varies across different zones of the country but ranges from 2.2 to 9.8%.^{6–9} The diabetes statistics of the International Diabetic Federation (IDF) showed that Nigeria has the highest number of people living with diabetes and impaired fasting glycaemia (IFG) in Africa.¹⁰ The huge burden of diabetes has serious economic implications for the individuals, families, communities, and the nation at large. The health system is also insufficient in terms of manpower and facilities needed to care for the large number of diabetes patients who access care in the health facilities.

The management of diabetes involves both medical and non-medical modalities. Medical management involves the use of oral medications and/or insulin while non-medical management involves lifestyle modifications such as appropriate diet, physical activity (moderate regular exercise), and home glucose testing.¹⁰ If diabetes patients are adequately educated on non-medical management modalities, it gives them the opportunity to actively participate in their care. A study in Ethiopia showed that patients who received information less frequently were less likely to adopt diabetes self-care.¹¹ It is unfortunate that little emphasis has been given to health education for diabetes patients in many healthcare facilities in Nigeria. This was demonstrated by Okolie et al in their study in south-eastern Nigeria.¹² The result of this lack of education is that many diabetes patients lack basic knowledge of the disease and its management,

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1. Age group		2. Gender	
31–40 years	7 (3%)	Male	94 (43%)
41–50 years	27 (13%)	Female	122 (57%)
51–60 years	74 (34%)		
61–70 years	84 (39%)		
>70 years	24 (11%)		
3. Diagnosis duration		4. Marital status	
1–5 years	102 (47%)	Married	175 (81%)
6–10 years	88 (41%)	Widowed	38 (18%)
11–15 years	18 (8%)	Single	4 (1%)
16–20 years	8 (4%)		
5. Education		6. Occupation	
None	14 (6%)	Professional	23 (11%)
Primary	53 (25%)	Managerial	30 (14%)
Secondary	88 (41%)	Skilled level I	22 (10%)
Tertiary	61 (28%)	Skilled level II	76 (35%)
		Semi-skilled	6 (3%)
		Unskilled	59 (27%)
7. Monthly income (Naira)			
<10 000	35 (10%)		
10 000 – 30 000	50 (23%)		
31 000 – 60 000	75 (35%)		
61 000 – 100 000	40 (19%)		
>100 000	16 (7%)		

Table 1 Socio-demographic characteristics of study patients (n=216)

was a composite score of 7–10; fair knowledge was a composite score of 5 or 6; poor knowledge was a composite score of 0–4. The questions used to assess the practice of non-medical management of diabetes addressed the following issues: engaging in regular exercise, blood pressure and blood glucose checks, compliance with a controlled and planned dietary regimen, weight measurements, and smoking habits. The occupations of the respondents were classified according to the UK Registrar Generals' classification of occupation.¹⁷

The Chi-square test was used to test the association between the socio-demographic variables of the patients and their knowledge. The study was approved by the Ethics and Research Committee of UBTH. Verbal informed consent was obtained from the respondents before they participated in the study.

Results

A total of 216 type 2 diabetes mellitus patients participated in the study. Table 1 shows the socio-demographic characteristics of the patients. The mean age (+SD) of the patients was 60+9 years with a high proportion in the 61–70 year age group. Most (81%) were married while more than two-thirds had attained at least secondary level education. A high proportion of the patients were engaged in a skilled level II occupation (35%) and had a monthly income of N31 000–N60 000 (35%). Almost half (47%) of the patients had been diagnosed with diabetes in the 1–5 years preceding the study, but 26 (12%) of them had lived with the condition for 11–20 years.

The majority (72%) of the patients had good knowledge of the non-medical management of diabetes, while only 2% demonstrated poor knowledge (Figure 1). The practice of the non-medical management of diabetes is shown in Table 2. A high proportion of the patients engaged in regular exercise and followed a controlled and planned dietary regimen (60% and 76% respectively). Most (93%) patients checked their weight monthly while weekly

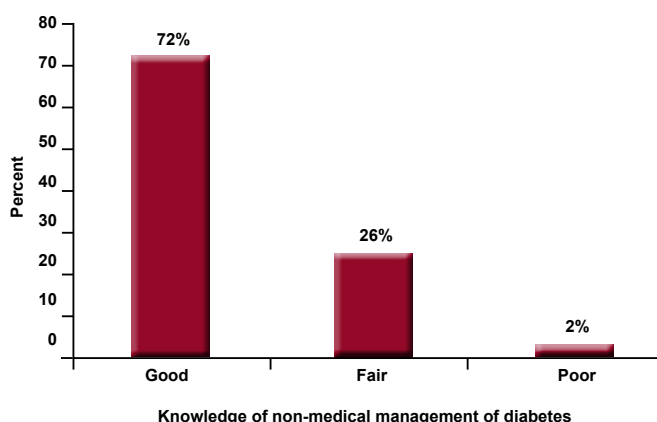


Figure 1 Patients' knowledge of the non-medical management of diabetes

especially self-care practices of weight control, appropriate diet, smoking cessation, and self blood glucose monitoring.^{13–15}

The objective of this study was to assess the knowledge and practice of non-medical management of diabetes among type 2 diabetes patients attending an outpatient clinic in the University of Benin Teaching Hospital (UBTH), Benin City, Nigeria.

Patients and methods

This descriptive cross-sectional study was carried out among type 2 diabetes patients attending the consultant outpatient clinic of UBTH, Benin City, Nigeria. The patients were recruited consecutively from the clinic from May to June 2013. The minimum sample size required for this study was calculated using the Cochran formula for descriptive studies.¹⁶

A structured interviewer-administered questionnaire was used for data collection. The questionnaire was used to assess the patients' knowledge and practice of the non-medical management of diabetes. Data collected were screened for completeness and analysed using the Statistical Package for Social Sciences (SPSS) version 20.

The ten questions used to assess the knowledge of non-medical management of diabetes were assigned a score of '1' for a correct response and a score of '0' for an incorrect response. According to their total composite score, each patient was classified as follows: good knowledge

Engaging in regular exercise	
Yes	130 (60%)
No	86 (40%)
Weight check	
Weekly	10 (5%)
Monthly	201 (93%)
Yearly	5 (2%)
Blood glucose check	
Nil	4 (2%)
Daily	3 (1%)
Weekly	35 (16%)
Monthly	174 (81%)
Possession of glucose meter	
Yes	102 (47%)
No	114 (53%)
Controlled and planned dietary regimen	
Yes	165 (76%)
No	51 (24%)
Blood pressure check	
Nil	3 (1%)
Weekly	59 (27%)
Monthly	154 (72%)
Smoking	
Yes	4 (2%)
No	212 (98%)

Table 2 The practice of non-medical management of diabetes by patients (n=216)

with the dietary regimen decreased with increasing duration of diagnosis. Both age and level of education of the patients were statistically associated with patients' engagement in regular exercise. The proportion of patients who engaged in regular exercise increased with both age and higher levels of education. The proportion of patients who possessed a meter increased with increasing level of education and increasing monthly income (this association was statistically significant).

Discussion

Non-medical management practices, often referred to as self-care, are ways in which diabetes patients actively participate in the management and control of their condition. These practices should be adequately communicated and reinforced to diabetes patients whenever they come in contact with healthcare systems. This study revealed that most patients were knowledgeable about the non-medical management of diabetes. This commendable finding could be due to the education given to diabetes

weight checks were done by 5%. Blood pressure checks were carried out monthly by most (72%), and weekly by 27%. Less than half (47%) possessed their own glucose meter for home glucose monitoring. Most patients (81%) checked their blood glucose monthly, 16% checked blood glucose weekly, while a daily check was done by only 1% of patients. As at the time of the study, almost all (98%) the patients were non-smokers.

The cross-tabulation of the socio-demographic characteristics of the patients and their practice of non-medical management of diabetes is shown in Table 3. There was a statistically significant association between the duration of diagnosis and compliance with a controlled and planned dietary regimen by the patients. The proportion of patients who complied

patients during their routine visits to the outpatient clinic in UBTH coupled with the high literacy level of the patients, as most had attained at least a primary level of education.

The higher proportion of female patients seen in this study is consistent with previous studies in Nigeria^{12,14,18} and in other parts of the world like Ethiopia¹¹ and Bangladesh.¹⁹ It has however also been documented that diabetes prevalence is higher in men, but there are more women with diabetes than men. Wild et al suggested that 'the combined effect of a greater number of elderly women than men in most populations and the increasing prevalence of diabetes with age is the most likely explanation for this observation'.²⁰ This explanation is also applicable to our study results. This finding may also suggest the fact that women generally use health services better than their male counterparts, since this is a hospital-based study.

Regarding the non-medical management practices, most patients engaged in regular exercise and also adhered to a controlled and planned dietary regimen. This is encouraging because a healthy diet combined with regular exercise improves glycaemia. In addition, it was reported that the risk of diabetes in patients with impaired glucose tolerance (IGT) decreased after a combined programme of nutrition and exercise when compared with a control group.²¹ It was not surprising that we found a significant negative association between duration of diagnosis and adherence to diet. Those who have been diagnosed for longer may experience monotony in their dietary habits, thus increasing their chances of default as compared with the newly diagnosed. This effect can be minimised by continuously educating patients on a wide variety of healthy diets. Age and level of education showed a significant association with regular exercise by the patients. It was surprising that a higher proportion of patients aged 41 years and above engaged in regular exercise when compared with those aged 31-40 years. This suggests that younger patients may place a lesser premium on the education given to them in the clinics than older patients. Concerning level of education, this study agrees with Ayele et al in their study in Ethiopia which found that individuals with elementary educational status were four times more likely to perform self-care than those unable to read and write.¹¹ The more educated a patient is, the more likely it is that he or she will be able to comprehend and understand their condition, including health education given in the clinics, and this may eventually translate to better self-care practices.

In this study, most patients checked their weight, blood pressure, and blood glucose on a monthly basis. This may mean that most wait until their clinic visits to carry out these practices, since most patients attending the clinic have monthly appointments. This is similar to the previous findings of Eregie et al in UBTH in which only 8% of the patients studied practiced self-monitoring of blood glucose at home.¹⁴ This situation is not good for effective control of diabetes and underscores the need for

(a) Controlled and planned diet				
Variables	Yes	No	χ^2	p value
1. Diabetes duration				
1–5 years	88	14	11.151	p=0.011
6–10 years	61	27		
11–15 years	11	7		
16–20 years	5	3		
2. Age group			2.860	p=0.582
3. Gender			2.412	p=0.120
4. Education			0.453	p=0.629
(b) Regular exercise				
1. Age group				
31–40 years	2	5	15.890	p=0.003
41–50 years	17	10		
51–60 years	52	22		
61–70 years	52	32		
>70 years	7	17		
2. Education level				
None	5	9	17.110	p=0.007
Primary	22	31		
Secondary	58	30		
Tertiary	45	16		
3. Gender			0.540	p=0.470
4. Diabetes duration			1.410	p=0.704
(c) Possession of glucose meter				
1. Education level				
None	5	9	24.340	p=0.00002
Primary	18	35		
Secondary	34	54		
Tertiary	45	16		
2. Monthly income				
<10 000	14	21	33.269	p=0.0001
10 000 – 30 000	25	25		
31 000 – 60 000	20	55		
61 000 – 100 000	31	9		
>100 000	12	4		
3. Age group			3.890	p=0.421
4. Gender			0.515	p=0.473
5. Diabetes duration			1.855	p=0.615
Note: Patient numbers are given only for variables which showed a significant association.				

Table 3 Socio-demographic characteristics and correlates with (a) planned dietary regimen, (b) regular exercise, and (c) possession of glucose meter

diabetes patients to possess weight, blood pressure, and blood glucose monitoring devices at home so that they can monitor these parameters between clinic visits. Blood glucose checks at home may give patients a self-appraisal of their diabetes control. This will serve as a source of reinforcement for those doing well, and a challenge for those who are not doing well, thus enhancing modification of behaviour. This study revealed that less than half of the patients owned a glucose meter. The income of patients is a major factor here because the cost of purchasing a meter may deter most patients from owning one. Most patients were engaged in either unskilled or skill level I and II occupations with a corresponding monthly income of less than N60 000 (US\$350). In Nigeria, with about 60% of the population living on less than US\$2 per day, out-of-pocket payment is the major means of financing healthcare, and so it will be difficult for patients to afford a glucose meter after paying for their drugs and other commodities in the hospital. A possible solution to this challenge is for the government and other relevant agencies to drastically reduce the price of self-care devices such as glucose meters, to make them affordable to diabetes patients irrespective of their socio-economic status.

In conclusion, type 2 diabetes patients attending the outpatient clinic of UBTH demonstrated a high level of awareness about the non-medical management of diabetes. Although their engagement in regular exercise and adherence to controlled and planned dietary regimens was good, the practice of self-monitoring of body weight, blood pressure, and blood glucose was poor. We recommend that there should be continuous promotion of these self-care practices and healthy lifestyles among type 2 diabetes patients whenever they come in contact with healthcare systems. We also advocate for the reduction in price of self-monitoring devices to make them easily affordable and common to all diabetes patients.

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Family history as a risk for early-onset type 2 diabetes in Kenyan patients

G N Kiraka, N Kunyiha, R Erasmus, P J Ojwang

Abstract

Early-onset type 2 diabetes is regarded as disease occurring before the age of 40 years. It is well described, and increasing in prevalence, but there is little information from Africa. We therefore assessed the prevalence of early-onset type 2 diabetes in Nairobi, Kenya; and investigated its association with family history. Of 140 patients with type 2 diabetes, 33 (24%) had an early onset. There was a positive family history of diabetes in 85% of those with early onset, compared with 56% of those with usual onset ($p=0.009$). This suggests that relatives of those with early-onset type 2 diabetes should have regular diabetes screening.

Introduction

Early-onset type 2 diabetes refers to type 2 diabetes diagnosed in patients before the age of 40 years.¹ Recent diabetes surveys show a drastic change in age clustering of diabetes incidence, with a growing number of adolescents and young adults being diagnosed with type 2 diabetes in developed and developing countries.²⁻⁴ Risk factors associated with early onset of type 2 diabetes include genetic factors, strong family history, race/ethnicity, and the various features of metabolic syndrome – i.e. abdominal obesity, hyperlipidaemia, and hypertension.^{5,6} Studies suggest that a higher prevalence of these clinical risk factors are found in early-onset type 2 diabetes patients compared with those with a more usual age of onset. This is in part due to changes in lifestyle and dietary patterns that predispose to an early onset of insulin resistance, and the development of the metabolic syndrome in younger patients.⁵ As a result, the incidence of type 2 diabetes in young adults before the age of 40 years is markedly on the rise.

Patients with early-onset type 2 diabetes make up between 9 and 36% of all type 2 diabetes patients in various ethnic populations studied.⁵ In Mexican Hispanics the prevalence has been described as 21%, while among Chinese patients the prevalence of early-onset type 2

diabetes was found to be 29%.^{7,8} Increasing prevalence of early-onset type 2 diabetes has led to studies investigating and describing risk factors that may be associated with this younger age of onset. However, very few of these studies have focused on patients of African origin.

Diabetes is a potentially inherited disease and the presence of family history is a known risk for early development of disease. The risk of type 2 diabetes among offspring with one diabetic parent has been shown to be 3.5 times higher, and for those with two diabetic parents it is 6 times higher compared with the offspring of parents without diabetes. Having a parent who developed diabetes before the age of 30 is in itself a major risk factor for early-onset diabetes in their offspring. In black South Africans, a family history of a diabetic relative was demonstrated in the majority of patients, regardless of aetiological subtype, though more strongly suggestive of a genetic or inherited mode of transmission of type 2 diabetes, especially on the maternal side.⁹ In Singapore, 80% of patients with early-onset type 2 diabetes reported a positive family history. We aimed to demonstrate an association between family history and age of onset of type 2 diabetes in a cohort of Kenyan patients.

Methods

This cross-sectional study was carried out from February 1, 2012 to April 30, 2012. The study was conducted at the diabetic clinic of the Aga Khan University Hospital, Nairobi, Kenya.

All patients attending the clinic who were aged 18 years and above with a clinical diagnosis of type 2 diabetes were eligible to participate. Exclusion criteria included type 1 diabetes, gestational diabetes, and diabetes resulting from secondary endocrine causes, e.g. thyrotoxicosis, Cushing's syndrome, acromegaly, or steroid use.

Patients were recruited by consecutive sampling. All patients meeting the inclusion criteria had a detailed explanation of the study aims and procedures, after which written consent to participate in the study was obtained. A questionnaire was administered to the patients by the principal investigator or primary physician via a face-to-face interview designed to record age at diagnosis, duration of disease, and family history of diabetes. For the purposes of the study, early-onset type 2 diabetes was defined as having diabetes with onset before the age of 40 years. The study was approved by the Aga Khan University Hospital Scientific and Ethical Review Committees.

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Results

Of 140 patients who consented to participate, 59% were male. The mean age of the patients was 55 years, and mean age at diagnosis was 48 years. The mean duration of disease was 7 years. The number of patients with early-onset type 2 diabetes in this study was 33 (24%). The distribution of patients by age of onset of diabetes is shown in Figure 1.

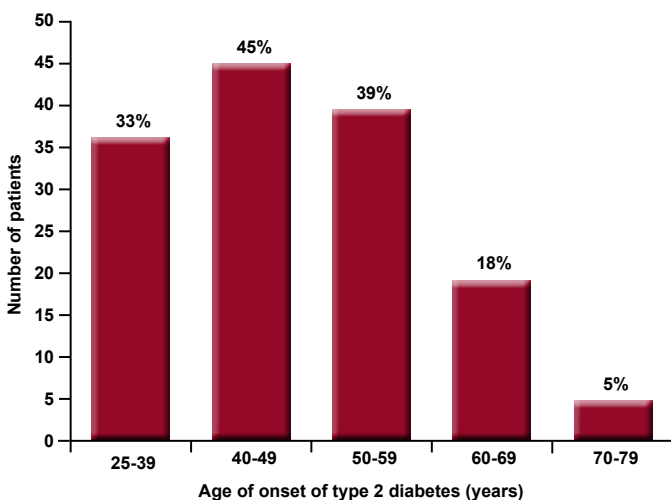


Figure 1 Age of diabetes onset compared with age groups

Figure 1. Age of diabetes onset compared by age. In all, 88 out of 140 patients reported having at least one relative with type 2 diabetes. This was higher for the early-onset group than the usual-onset group. A patient

with early-onset type 2 diabetes was 3.6 times more likely to have a diabetic relative compared with a patient with usual-onset diabetes. This association was statistically significant ($p < 0.009$). Patients with early-onset type 2 diabetes were 3.9 times more likely to report a first-degree relative (parent, sibling, or child) with diabetes. Having two diabetic relatives was also associated with early-onset diabetes with an odds ratio of 5.1 ($p < 0.017$). Patients with early-onset type 2 diabetes were also 2.7 times more likely to report more than three relatives with diabetes, although this association was not statistically significant ($p < 0.137$). These results are summarised in Table 1.

Discussion

Early-onset type 2 diabetes was found in 24% (95% confidence interval (CI) 17-33%) of type 2 diabetes patients in our institution. This suggests a high incidence in our population. There was a strong association between family history and early onset of type 2 diabetes, and an increased risk for patients with a first-degree relative with type 2 diabetes, and for patients having two relatives with type 2 diabetes.

A positive family history of type 2 diabetes was present in 63% of patients. It is generally expected that the rates of a positive family history will be higher for diabetic patients as reported in South African blacks where 27% of diabetic patients had a diabetic relative compared with 3% of healthy controls.

Family history of type 2 diabetes was associated with early onset of disease, as was having a first-degree relative with diabetes and having two or more relatives with

	Early-onset type 2 diabetes (n=33)	Usual-onset type 2 diabetes (n=107)	Odds ratio	95% confidence interval	p value
Positive family history	28 (85%)	60 (56%)	3.58	1.37-9.36	0.009
Family history: at least one first-degree relative	23 (70%)	45 (42%)	3.92	1.46-10.52	0.007
Family history: at least one second-degree relative	5 (15%)	15 (14%)	2.56	0.68-9.59	0.164
Family history: one relative	17 (51%)	37 (35%)	3.52	1.26-9.83	0.016
Family history: two relatives	6 (18%)	9 (8%)	5.11	1.34-19.48	0.017
Family history: three or more relatives	5 (15%)	14 (13%)	2.74	0.72-10.34	0.137

Table 1 Association of family history with age of onset of diabetes

diabetes. Eighty-five per cent (85%) of the early-onset group reported at least one diabetic relative compared with 56% of the usual-onset group. In a similar African study, family history was an independent risk factor for type 2 diabetes.¹¹ In a Canadian survey more than 90% of children and youths with type 2 diabetes reported a diabetic first- or second-degree relative.¹² A strong family history suggests a genetic predisposition to both type 2 diabetes and metabolic syndrome, and may increase the risk of early-onset of diabetes. Thus, screening family members of diabetic patients is a proposed public health strategy. A targeted family member diabetic screening programme would have to start at a much earlier age (perhaps early twenties) in order to be effective.

In conclusion, this study showed a high proportion of early-onset type 2 diabetes among type 2 patients in our institution. We also found a significant association between family history of type 2 diabetes and an early onset of diabetes, especially for those having first-degree and multiple diabetic relatives. Relatives of patients with type 2 diabetes should be offered screening early in adulthood to allow for early detection and treatment.

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Knowledge and awareness of diabetes among adolescents in Port Harcourt, Nigeria

B A N Okoh and T Jaja

Abstract

Diabetes is becoming a global burden, with prevalence increasing in both children and adults. This study aimed to determine the level of awareness and basic knowledge of diabetes among adolescents in secondary schools in Port Harcourt, southern Nigeria. It was a cross-sectional study carried out in six selected schools. A structured questionnaire was used to collect information from the students on their basic knowledge of diabetes (such as cause, symptoms, and awareness of childhood diabetes). Out of 880 students interviewed, 293 (33%) identified that diabetes was a disease of high blood glucose, but only 2 (0.2%) knew that it was a disease associated with insulin deficiency. In addition, 291 (33%) stated it was a disease caused by excessive consumption of sugar. Only 37% could identify two or more symptoms of diabetes. Eleven students had a family history of diabetes, but there was no statistically significant difference in knowledge of the cause and symptoms of diabetes in those with or without a family history. Significantly more males, and students in senior classes, had better knowledge of diabetes. The commonest source of the students' knowledge of diabetes was from doctors (37%) and from teachers (33%). Awareness and knowledge of diabetes among adolescents in Port Harcourt was low, and possibly represents the knowledge of the general populace. There is a need for more education in secondary schools on diabetes in childhood by well-informed health workers and teachers.

Introduction

There is a growing prevalence of diabetes among children and adolescents. Globally, it is estimated that the number of people with diabetes will increase from 140 million in 2002 to over 300 million in 2030.¹ In Nigeria, the prevalence of diabetes among children has increased over the years from 0.1/1000 to as high as 10.1/1000.^{2,3} Several factors have accounted for this increase, includ-

ing urbanisation and adoption of a Western lifestyle, with reduced physical activity and excess caloric intake.⁴ Several studies conducted in many parts of the world suggest that there is lack of public awareness and knowledge of various factors related to diabetes.^{4,6}

This study therefore aimed to determine the level of awareness and knowledge of adolescents in public secondary schools on certain aspects of diabetes, in terms of meaning, cause, symptoms, and its occurrence in childhood. The data from this study will form a baseline for planning the education of adolescents (and young people and the community in general) about diabetes.

Methods

The study was carried out among students aged 10–19 years in selected public secondary schools in Port Harcourt, Nigeria. It was part of an ongoing study on enlightenment and screening for pre-diabetes in secondary school students in the Port Harcourt Local Government Area of Rivers State, Nigeria.

A structured questionnaire was used to obtain information on basic knowledge of diabetes and awareness of diabetes in children. 'Awareness of diabetes' meant simply having heard of the disease. Knowledge of diabetes and its cause required a response that included 'high blood glucose levels' and 'deficiency of insulin'. Knowledge of at least two symptoms of diabetes required mention of polyuria, polydipsia, hyperplasia, weight loss, bedwetting, or ants gathering around urine.

Ethical clearance was obtained from the University of Port Harcourt Teaching Hospital Ethics Committee. Permission was obtained from the head teachers of the individual schools. Data were entered into an Excel spreadsheet and analysed using the Statistical Package for the Social Sciences (SPSS) version 17. Comparison of proportion was done using the Chi-square test, and statistical significance was set at $p < 0.05$.

Results

Eight hundred and eighty students aged 10–19 years participated in the study. There were 577 (66%) females and 303 (34%) males. The mean age was 15 ± 2 (standard deviation, SD) years. There was no statistically significant difference between the mean age of males and females. Of the 880 students, 399 (45%) were in junior secondary classes (JS1–3), while 481 (55%) were in senior secondary

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classes (SS 1–3). The sources of information on diabetes for the participants were school teacher (33%), doctor (37%), radio or television (25%), newspaper (2%), friends (1.5%), and uncertain (1.5%).

Variable	Awareness of diabetes?		Total	p value	
	Yes	No			
Gender	Male	270 (89%)	33 (11%)	303	0.004
	Female	471 (82%)	106 (18%)	577	
Class level	Junior	296 (74%)	103 (26%)	399	<0.001
	Senior	445 (92%)	36 (8%)	481	

Table 1 Relationship between gender, class level, and diabetes awareness

Table 1 shows the proportions of students who were aware of diabetes, by gender and class level. Awareness was significantly higher in males and in senior class students. Table 2 shows answers to specific diabetes-related questions. There were 33% who knew that diabetes meant an abnormally high blood glucose level, but only 2 (0.2%) were aware that it was due to deficiency of insulin. Most (99%) of those who knew that diabetes was associated with raised blood glucose thought that the cause was an excessive intake of sugar. Of the other questions, 87% knew the disease occurred in childhood, and 37% could name at least two symptoms.

	Correct	Incorrect	Don't know	Total
Knowledge of what diabetes is	293 (33%)	261 (30%)	326 (37%)	880
Knowledge of occurrence of diabetes in children	766 (87%)	106 (12%)	8 (1%)	880
Knowledge of at least two symptoms of diabetes	327 (37%)	181 (21%)	372 (42%)	880

Table 2 Aspects of knowledge of diabetes

Table 3 shows that knowledge of what diabetes is had no relationship with gender, or whether the participant had a family history of diabetes. Knowledge was, however, statistically significantly associated with senior class level. Table 4 similarly relates knowledge of diabetes symptoms with the same variables. There was no relationship with gender or family history, but again, knowledge was higher in senior class students.

Discussion

In this study, the response of the adolescents in public secondary schools when asked about the cause of diabetes revealed a poor knowledge among this age group. Diabetes is caused by absolute or relative lack of the hormone insulin and in this study only two students knew this. This response rate is lower than the 40%⁴ and 20%⁷ reported among adolescents in Uyo and Oghara

respectively. The differences in the rates may be attributed to the way the questions were framed in the different studies. In this study, open-ended questions were asked with no options given whereas the other studies provided options. Also, this study and in the Oghara study⁷ used students from both junior and senior secondary classes whereas the study in Uyo⁴ used students from the senior secondary classes only; this difference could also have accounted for the higher rate seen in the Uyo⁴ response.

Although most students knew that diabetes is a disease associated with increased blood glucose levels, they often believed that diabetes is caused by excessive consumption of sugar. Although this was not directly reflected in other results from Uyo,⁴ Oghara,⁷ and even Pakistan,⁸ the low rate of correct responses as to the possible cause of diabetes in all these studies may reflect a misconception handed down in the general populace by uninformed educators or an impression that is left after health talks.

Identification of the symptoms of diabetes is a very important link to early diagnosis of diabetes. The symptoms are easily recognisable and with awareness should prompt early treatment seeking. In this study, it must be noted that as many as 40% of the adolescents did not know any symptoms of diabetes, or gave wrong answers. As in many other studies,^{4,7,8} the commonest symptom mentioned was excessive passing of urine. Only 37% of students in this report could mention two or more correct symptoms of diabetes. This is, however, higher than the 13% reported in Oghara and the 29% in Uyo.^{4,7}

Knowledge of diabetes may be determined by various factors. In this study, the knowledge of diabetes was higher in males and in students in the senior

secondary classes. This finding could be attributed to more interest in the media exhibited by males, and also to the greater exposure to informational materials of the senior secondary classes.

There is a common belief that diabetes only occurs in adults. In this study, significant numbers of the respondents were aware that diabetes occurs in children and adolescents. This was also the finding in Uyo where about 70% of respondents agreed that diabetes occurred in adolescents.⁴ Most children and adolescents with diabetes present for the first time in diabetic ketoacidosis (DKA), and this is due to poor knowledge and awareness. In areas where the level of awareness is high, early presentation and avoidance of DKA (a major cause of mortality) may be achieved in children and adolescents with newly presenting diabetes.^{9,10}

In this study, there was a wide range of sources of

		Knowing what diabetes is			
		Correct	Incorrect	Total	p value
Gender	Male	111 (37%)	192 (63%)	303	0.128
	Female	182 (31%)	395 (68%)	577	
Class level	Junior	87 (22%)	312 (78%)	399	<0.001
	Senior	206 (42%)	275 (57%)	481	
Family history of diabetes?	Yes	30 (31%)	68 (69%)	98	0.550
	No	263 (34%)	519 (66%)	782	

Table 3 Relationship between knowledge of diabetes and gender, class level, and family history

Knowledge of at least two symptoms of diabetes					
		Correct	Incorrect/ don't know	Total	p value
Gender	Male	123 (41%)	180 (59%)	303	0.126
	Female	204 (35%)	373 (65%)	577	
Class level	Junior	121 (30%)	278 (70%)	399	<0.001
	Senior	206 (43%)	275 (57%)	481	
Family history of diabetes?	Yes	42 (43%)	56 (57%)	98	0.215
	No	285 (36%)	497 (64%)	782	

Table 4 Relationship between knowledge of diabetes symptoms, and gender, class level, and family history

information on diabetes. Information was received mainly from doctors and teachers. There is therefore a need to train school teachers to improve on the information they give to students. However, there is no doubt that the mass media also plays a very important role in the dissemination of information on diabetes, including to young people, who account for a large proportion of the populace. This wide and relatively easy form of knowledge dissemination should be taken advantage of by health workers to give the correct information on diabetes.

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Hyperglycaemic emergencies in pregnancy: case reports and literature review

RN Oputa and NA Ododo

Abstract

Two cases are presented of diabetic ketoacidosis (DKA) occurring in newly presenting gestational diabetes mellitus (GDM) in Nigeria. Both were associated with foetal death, and the cases emphasise the need for efficient GDM screening and patient education. GDM is increasing in frequency, and the 2013 World Health Organization (WHO) Guidelines give simple and applicable guidelines for screening, diagnosis, and management. Even glycosuria testing can be helpful at a primary care level. The reoccurrence of GDM is also high (up to 50% of cases), and such women should be encouraged to seek early antenatal care in subsequent pregnancies.

Introduction

Globally, about 1-14% of pregnancies are complicated by hyperglycaemia.¹⁻³ However, recent evidence from the International Diabetes Federation (IDF) shows that the comparative prevalence of hyperglycaemia in pregnancy in women aged 20-49 years can be as high as 25% in the SouthEast Asia (SEA) region.⁴ Diabetes that is first diagnosed in pregnancy is called gestational diabetes mellitus (GDM) and usually resolves after pregnancy. A retrospective study in Nigeria showed that the incidence of diabetes in pregnancy is 1.7%.⁵ The study showed that 39% of the cases were known cases of diabetes before pregnancy, while 61% were cases of GDM. The WHO 2013 Guidelines recommend that a diagnosis of GDM should be given at any time in pregnancy if one or more of the following is/are present: fasting plasma glucose (FPG) of 5.1-6.9 mmol/l; 1-hour plasma glucose ≥ 10.0 mmol/l following a 75 g oral glucose load; or a 2-hour plasma glucose of 8.5-11.0 mmol/l following a similar oral glucose load.^{4,6} All types of diabetes are associated with increased maternal and foetal morbidity

and mortality, and this is worse in poorly controlled cases. Poor diabetic control early in pregnancy is associated with spontaneous abortion, congenital malformations, intrauterine foetal death, and macrosomia. Later in pregnancy, poor diabetic control is associated with polyhydramnios and preterm delivery. Plasma glucose values greater than 10.0 mmol/l (180 mg/dl) are considered unsafe, and are associated with foetal hypoxia and a wide variety of foetal and maternal complications.⁷⁻⁹ This report describes two cases of severe hyperglycaemic emergencies in patients newly presenting with GDM.

Case 1. A 30-year-old lady was admitted with a 1 week history of polyuria, polydipsia, generalized body weakness, and upper abdominal pain. She was not known to have diabetes. She was 28 weeks pregnant, gravida 2; her first baby was a live female, born 14 months previously weighing 3.5 kg, and delivered by spontaneous vaginal birth at 39 weeks. On examination the patient was ill, drowsy, and dehydrated. Pulse was 120 beats/minute and regular; blood pressure (BP) was normal. The patient had Kussmaul's respiration, the fundal height was 28 weeks, and there were no foetal heart sounds. Urine was ++ positive for glucose, protein, and ketones. Glucose meter blood glucose (BG) level was >33.3 mmol/l. A diagnosis of GDM, diabetic ketoacidosis (DKA), and intrauterine death was made; and she was treated with intravenous fluids and insulin. She improved, but delivered a stillbirth. On discharge 6 days later her fasting blood glucose (FBG) was 11.8 mmol/l, at follow-up it was 5.0 mmol/l.

Case 2. A 29-year-old woman was admitted at about 28 weeks of pregnancy. She complained of weakness, nausea, polyuria, polydipsia, nocturia, and paraesthesia of 1 week's duration. Her father had diabetes. She had her first baby 3 years ago by Caesarean section and the baby weighed 6.4 kg. She was not diagnosed as diabetic during her first pregnancy. On examination she was dehydrated and lethargic. She had a pulse of 132 beats/minute and a BP of 130/50 mmHg. Her glucometer BG was >33.3 mmol/l. Abdominal ultrasound showed an absence of foetal activity and a gestational age of 24 weeks and 4

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Case Report

days. Her urine was ++ positive for glucose and ketones. A diagnosis of GDM, DKA, and foetal death was made; and she was treated with intravenous fluids and insulin. She had a stillbirth after induction, by vaginal delivery. She was discharged 14 days after admission, and at the time her FBG was 4.8 mmol/l.

Discussion

Both these cases presented with extreme hyperglycaemia and ketosis clinically consistent with DKA. Neither of the women had previously diagnosed GDM, in the current or past pregnancies. Both were well educated, but presented with their symptoms late.¹⁰⁻¹² DKA in pregnancy is known to occur, and rates of 2.0- 9.3% have been reported.¹³⁻¹⁵ It can occur in both pre-existing type 1 diabetes and GDM, and may be precipitated by malaria,¹³ or other infections such as urinary tract infection, gastro-enteritis, or pneumonia.¹³⁻¹⁵

Total live births in women aged 20–49 years were estimated to be 127.1 million globally in 2013.⁴ The number with hyperglycaemia in pregnancy was 21.4 million – a prevalence of 16.8%. In Nigeria, the retrospective hospital study done in Enugu, south-east Nigeria, showed a high proportion of GDM compared with cases of pregnancy where diabetes was previously known about – 61% and 39% respectively.⁵ Most of the cases of hyperglycaemia in pregnancy occur in low and middle income countries, where access to maternal care is limited – in fact 92% of all cases of hyperglycaemia in pregnancy occur under this setting. Table 1 shows the seven regions of the International Diabetes Federation (IDF) and the number of cases of diabetes in live births (in millions), comparative prevalence (%), and the proportion that may be due to diabetes in pregnancy.

In conclusion, there is a growing epidemic of GDM. The two cases reported here showed extreme high blood glucose values on presentation, complicated by ketoacidosis and stillbirth, in two young women.

Efficient screening for GDM is vitally important if severe complications such as these are to be avoided. Patient education is also important, to enhance awareness of diabetes-related symptoms.

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IDF region	Cases in live births (millions)	Comparative prevalence (%)	Cases due to GDM (%)
Africa	4.6	14.4	19.6
Europe	1.7	12.6	10.9
Middle East & North Africa	3.4	17.5	17.7
North America & Caribbean	0.9	10.4	24.9
South & Central America	0.9	11.4	17.3
South East Asia	6.3	25.0	9.5
Western Pacific	3.7	11.9	14.1
Total/Mean	21.4 million	14.8%	16.3%

Table 1 Hyperglycaemia in pregnancy (age 20-49 years) by IDF regions, 2013.⁴



The Editors welcome articles on diabetes, and the management of diabetic diseases, from all health professionals, medical and non-medical. The philosophy of the journal is to reflect as much as possible the multi-disciplinary nature of diabetic care. The *African Journal of Diabetes Medicine* seeks to fulfil a role in continuing medical education and, therefore, welcomes in particular review articles which provide practical updates on the management of diabetic patients. Original research studies will constitute an important minority of the articles published. In assessing the suitability of research papers for publication, the Editors will favour those contributions which will provide readers with information of practical use in their day-to-day practice. Advice and assistance will, wherever possible, be provided to potential authors on the scope of their research or method of presenting papers.

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