Volume 23 Number 1

May 2015

AJDM

The African Journal of Diabetes Medicine

Knowledge and impact of diabetes in patients in a tertiary clinic in Southeast Nigeria

Diabetes in Nigeria – a translational medicine approach

Prevalence of prediabetes in secondary school students in Port Harcourt, Nigeria

Age at diagnosis and duration of type 2 diabetes seen in Benin City, Nigeria

From the Journals

Diabetic retinopathy in Malawi

Burgess PI, Allain TJ, Garcia-Finana K, et al. High prevalence in Malawi of sight-threatening retinopathy and visual impairment caused by diabetes: identification of population-specific targets for intervention. *Diabetic Medicine* 2014; 31: 1643-1650

There is surprisingly little accurate information on the prevalence of retinopathy in Africa. Past reports have used very different methods. Most have used direct ophthalmoscopy through undilated pupils, which is notoriously inaccurate and very susceptible to observer error. The point often made in Africa is that even if retinopathy is discovered, what can be done about it? The 'gold standard' treatment for sight-threatening changes (usually maculopathy or proliferative retinopathy) is laser therapy, which is frequently unavailable. A recent study from Blantyre in Malawi provides accurate, good-quality information on the size of the problem. The authors examined 357 diabetic subjects with a median age of 54years and diabetes duration 4years. Fundi were examined by digital camera through dilated pupils, and accepted criteria were used for classifying retinopathy. Overall, 50% had retinopathy, 7% had proliferation, 26% maculopathy, and 29% were considered to have sight-threatening disease. These are worrying figures, particularly for a cohort with such a short duration of diabetes. African countries need to be planning effective screening and treatment programmes for this potentially devastating complication of diabetes.

Analogue insulin debate

Tricco AC, Ashoor HM, Antony J, et al. Safety, effectiveness, and cost-effectiveness of long-acting versus intermediate-acting insulin for patients with type 1 diabetes: a systematic review and network meta-analysis. *Brit Med J* 2014; 3249: g5459 doi: 10.1136

Analogue insulins have, in western countries at least, taken over the majority of the insulin market for both type 1 and type 2 diabetes. However, there is increasing concern over whether their benefits are worth their costs (often about 3 times that of standard human insulins), particularly in type 2 diabetes. For patients with type 1 diabetes, there has been reasonable evidence that analogue long-acting insulins may reduce nocturnal hypoglycaemia risk, and possibly improve HbA1c levels. Good comparative trials of analogue versus human insulins are relatively infrequent however, so a recent systematic review and meta-analysis from Canada is welcome. There were 39 studies analysed, involving 7496 patients with type 1 diabetes. The long-acting insulins used were Glargine (once-daily) or Detemir (once or twice daily), and the intermediate-acting insulin was human isophane (NPH) once or twice daily. The authors concluded that the long-acting analogues were 'probably superior' though the difference was 'small for HbA1c'. Many in resource-limited countries would see these results as showing doubtful cost-effectiveness. Glargine, however, will be coming off patent in the near future, so its price may well drop. We have, therefore , not heard the last of the 'analogue debate'!

T2DM, glycaemia and cardiovascular risk

Chiasson J-L, Le Lorier J. Glycaemic control, cardiovascular disease and mortality in type 2 diabetes. Lancet 2014, 384: 1906-1907

A recent editorial in the Lancet comments on a new analysis from the Canadian 'ACCORD' study (Lancet 2014, 384: 1936-1941) examining the effect of glycaemic control in type 2 diabetes (T2DM) on the risk of developing ischaemic heart disease (IHD). This is a controversial area – previous studies have shown a clear benefit from good glycaemic control in reducing microvascular complication risk in T2DM, but the effect on large vessel disease has been at least small, and possibly uncertain. The current ADVANCE analysis suggests that tight glycaemic control (HbA1c <7.0%) reduced non-fatal coronary events by about 10 to 15%. The writers of the accompanying editorial draw attention to previous meta-analyses of other papers suggesting a similar, though smaller (9%) reduction in non-fatal IHD events, but no effect on mortality. They also remind us that in certain patients, tight glycaemic control may increase mortality risk. Overall, the result support a policy of optimising glycaemic control in type 2 diabetes, without causing hypoglycaemia, and being particularly cautious in those with particularly high cardiovascular risk. An common problem with studies such as this is that they involve white Caucasian patients, and whether the results are directly transferrable to black African populations (who have a relatively lower risk of atherosclerosis) is uncertain.

Diabetic neuropathy and the brain

Selvarajah D, Wilkinson ID, Maxwell M, et al. Magnetic resonance neuroimaging study of brain structural differences in diabetic peripheral neuropathy. *Diabetes Care* 2014; 27: 1681-1688

Diabetic peripheral neuropathy has, in the past, been not unreasonably considered to be a disease of peripheral nerves – damaged by microvascular disease, metabolic dysfunction, or both. However, there is growing evidence that in peripheral neuropathy, the central nervous system (CNS) may be also affected. A well-known research group from Sheffield in the UK, have previously shown that the cross-sectional area of the spinal cord is reduced in diabetic patients with neuropathy compared to those without. In their latest study, they report magnetic resonance (MR) brain imaging in 36 subjects with type 1 diabetes – 18 with no neuropathy, 9 with neuropathy, and 9 with painful neuropathy. Additionally, 18 non-diabetic controls were investigated. Brain grey matter volume was significantly lower in neuropathic compared with non-neuropathic subjects (p=0.001). Volumes for non-diabetic controls and non-neuropathic diabetic patients were similar, as were volumes between the painful and painless neuropathy groups. The grey matter volume loss was particularly found in regions concerned with somatosensory perception. This is a fascinating study, confirming that diabetes-related neuropathic states involve damage to the central, as well as the peripheral nervous system.

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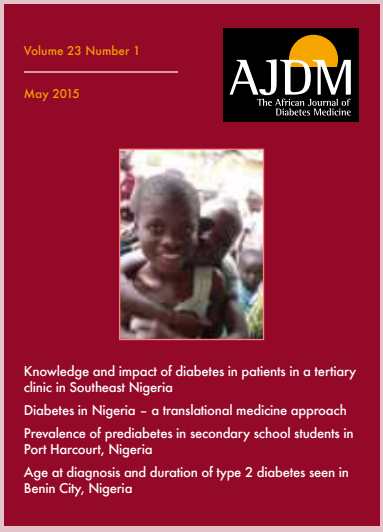

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ISSN 2042-8545 (Print)
ISSN 2053-4787 (Online)

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Erratum
In *AJDM*'s November 2014 edition (Vol 22 No 2, pages 8-9), Adrian Sanders name was misspelt as 'Saunders' instead of 'Sanders'. We would like to apologies for this mistake. The digital version of the manuscript has been updated on the website.

Editorial
The problem of 'prediabetes'

This edition of *AJDM* contains a very interesting article by Dr. T Jaja and colleagues from Nigeria, concerning the problem of 'prediabetes' in secondary school students. They found that impaired fasting glycaemia (IFG) occurred in 17%. Of these, a subgroup underwent oral glucose tolerance testing, and 15% had impaired glucose tolerance (IGT). These prediabetic states were, as perhaps expected, associated with obesity and a family history of diabetes.

What is prediabetes and what is its significance? It is generally thought that the term includes patients with IFG and/or IGT, and that it carries a high risk of progression to type 2 diabetes, and may also be an independent vascular risk factor. An immediate difficulty is that definitions of IFG vary. In particular, the American Diabetes Association (ADA) recommends a fasting glucose range of 5.6 to 6.9 mmol/l rather than the World Health Organization (WHO) levels of 6.0 to 6.9 mmol/l for the diagnosis of IFG. More recently, glycated haemoglobin (HbA1c) has been used for the definition of prediabetic states, and again there is discrepancy between ADA (5.7 to 6.4%) and WHO (6.0 to 6.4%) definitions.

The lower ADA definitions have significant implications for the numbers diagnosed with states of intermediate glycaemia, and there has been recent debate as to whether these low criteria are realistic or adequately evidence-based.[1] The article from Nigeria in this issue of the *AJDM* is a good example of the problems these varying definitions may cause. These workers used American criteria, and showed an IFG prevalence of 17%, but using WHO criteria it was only 4%.

Prediabetes is a useful term for identifying those at risk from type 2 diabetes, and they are a good group to target healthy living education. However, we urgently need a globally agreed definition.

Professor Geoff Gill.
Editor, African Journal of Diabetes Medicine, Liverpool School of Tropical Medicine, Liverpool, UK

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In the news

Merck collaborates with African and Asian Universities to build diabetes and hypertension healthcare capacity in the two continents

Leading company for innovative and top-quality high-tech products in healthcare, life science and performance materials, Merck, in collaboration with Maharashtra University of Health Sciences and Directorate of Medical Education and Research is introducing European Accredited Clinical Diabetes management for more than 5000 medical students in 18 medical colleges of Maharashtra University as part of Merck Capacity Advancement Programme (CAP) in Asia.

The course is European accredited and will be incorporated in the Bachelor of Medicine and Basic Surgery curricula of 18 medical colleges.

Dr. Stefan Oschmann, Vice Chairman and Deputy CEO of Merck said: 'Merck is pleased to collaborate with Maharashtra University of Health Sciences and Directorate of Medical Education and Research as part of our commitment to building healthcare capacity and providing sustainable access to high-quality health solutions and safe medicines in India. It marks another step in our commitment to working with governments and other stakeholders in building healthcare capacity with a focus on non-communicable diseases in various countries in Asia-Pacific, Middle East Africa and Latin America.'

Merck CAP aims at expanding the professional capacity in the areas of research and development, clinical research, supply chain integrity and efficiency, pharmacovigilance, medical education and awareness for medical and pharmacy undergraduates, physicians and pharmacists in rural areas.

The 5-year programme was kicked off successfully in seven sub-Saharan countries including Kenya, Uganda, Namibia Angola, and Ghana, and will further expand to other sub-Saharan countries and Asia.

Eating eggs reduces risk of type 2 diabetes

Egg consumption may reduce the risk of type 2 diabetes, according to new research from the University of Eastern Finland. The findings were published in *The American Journal of Clinical Nutrition*.

In some studies, high-cholesterol diets have been associated with disturbances in glucose metabolism and risk of type 2 diabetes. In contrast, in some experimental studies, the consumption of eggs has led to improved glucose balance, among other things. However, there is no experimental data available on the effects of egg consumption on the incidence of type 2 diabetes. In population-based studies, too, the association between egg consumption and type 2 diabetes has been investigated only scarcely, and the findings have been inconclusive.

The dietary habits of 2332 men aged between 42 and 60 years were assessed at the baseline of the Kuopio Ischaemic Heart Disease Risk Factor Study at the University of Eastern Finland in 1984–1989. During a follow-up of 19.3 years, 432 men were diagnosed with type 2 diabetes.

The study found that egg consumption was associated with a lower risk of type 2 diabetes as well as with lower blood glucose levels. Men who ate approximately four eggs per week had a 37% lower risk of type 2 diabetes than men who only ate approximately one egg per week.

In addition to cholesterol, eggs contain many beneficial nutrients that can have an effect on, for example, glucose metabolism and low-grade inflammation, and thus lower the risk of type 2 diabetes. The study also suggests that the overall health effects of foods are difficult to anticipate based on an individual nutrient such as cholesterol alone.

The link between cancer, diabetes and heart disease has been revealed

A new study has revealed that shared risk factors lead to diabetes, heart disease and cancer.

The World Cancer Research Foundation has concluded that obesity is a major cancer risk factor, likely causing around 20% of cancers of the breast, esophagus, colon, kidney, endometrium, pancreas, and gall bladder in the United States.

Likewise, overweight and obesity contributes to diabetes and cardiovascular disease, causing 58% of type 2 diabetes and 21% of ischaemic heart disease, according to the World Heart Federation.

Shared risk factors for cancer, diabetes and cardiovascular disease also include, most importantly, tobacco, diet quality, physical activity and alcohol use.

University of Colorado Cancer Centre investigator Tim Byers said that by stepping back to look system-wide, researchers from many disciplines could collaborate and share knowledge, leading to a better understanding of how these risk factors work at the tissue, cellular and molecular levels to drive these diseases.

Having depression or diabetes raises the risk of dementia by up to 80% - and even more if you suffer both

People with depression or diabetes have an increased risk of dementia later in life, a new study claims.

A diagnosis of either condition was linked with a higher risk - which was even greater among those suffering from both, researchers found.

Diabetes and major depression are common chronic diseases. More than 250 million people worldwide have depression, according to the World Health Organization. And in 2014, 9% of the global adult population had diabetes.

Researchers wanted to find out whether being diagnosed with one of these diseases increased the risk of developing dementia.

A team led by Dr. Dimitry Davydow, of the University of Washington School of Medicine, examined the risk of dementia among people with depression, type 2 diabetes or both.

They then compared these results with people who had neither condition, looking at data for more than 2.4 million Danes aged 50 or older, who were free of dementia from 2007 through to 2013.

Overall, 19.4% of the group had a diagnosis of depression, 9.1% had type 2 diabetes, and 3.9% had diagnoses of both diabetes and depression.

The researchers found that during the study period, 2.4% of people developed dementia and the average age of their diagnosis was nearly 81.

Of those who developed dementia, 26.4% had depression alone and 10.8% had type 2 diabetes alone, while 6.7% had both conditions.

Having both depression and type 2 diabetes was associated with a 117% greater risk of developing the condition, researchers revealed.

The use of oral hypoglycaemic agents in gestational diabetes

A Ernest and B Mpondo

Introduction

Tight glycaemic control has been a cornerstone in the prevention of maternal and neonatal complications associated with gestational diabetes. For decades, insulin has been the only drug considered to be absolutely safe in pregnancy. The use of oral hypoglycaemic agents (OHAs) in gestational diabetes was thought to be associated with congenital anomalies, pre-eclampsia, and neonatal hypoglycemia.[1–5] Previous studies on animal models showed that the use of OHAs was associated with congenital malformation, neural tube defects, and reduction in yolk sac protein values.[1–3] A small number of case reports on human subjects reported congenital malformations associated with the use of, or exposure to, oral agents during pregnancy.[4,5] Based on these facts, physicians were hesitant to use oral agents in pregnant women. Nevertheless, recent work on oral agents and pregnancy has revealed that some oral agents are safe, with comparable efficacy to insulin when used in patients with gestational diabetes. Compared with insulin, oral agents are simple to use and are less expensive, hence compliance is improved. Oral agents are ideal in Africa, where proper use and manipulation of insulin is problematic, resulting in poor glycaemic control. The oral agents glibenclamide and metformin are widely available in Africa and yet are being underutilised; this article reviews the use of metformin and glibenclamide in the management of gestational diabetes in Africa.

Glibenclamide

Studies have shown that glibenclamide is a safe oral agent for use in pregnancy since it rarely crosses the placenta.[6] A randomised study by Notelovizt in 1971 compared the use of tolbutamide, chlorpropamide, diet, and insulin in 208 subjects and found no significant difference in terms of congenital anomalies and perinatal mortality with optimal glycaemic control.[7] Furthermore, a large randomised controlled trial by Langer et al. comparing the use of glibenclamide (known in North America as 'glyburide') and insulin in women with gestational diabeteswho failed to achieve glycaemic control with diet or insulin showed no significant differences between the two groups in the incidence of pre-eclampsia, neonatal hypoglycaemia, congenital anomalies, macrosomia, perinatal mortality, cord-serum insulin concentrations, and rates of Caesarean section.[8] A total of 404 women were randomly selected to take either of the treatments and the results showed that 82% of the glibenclamide group and 88% of the insulin group achieved good glycaemic control, with less maternal hypoglycaemia in the glibenclamide group as compared with the insulin group (2% and 20% respectively).[8] Additionally, a number of non-randomised or retrospective studies have indicated that glibenclamide is effective in achieving glycaemic control in the majority of patients.[9] Failure to achieve glycaemic control with glibenclamide was linked to higher glucose level upon diagnosis of gestational diabetes and early dietary failure.[10] With regard to the safety of glibenclamide to the foetus, Elliot et al. documented the differences in transfer of sulfonylureas through the placenta. While tolbutamide diffused freely, with glibenclamide there was no significant transport in the maternal to foetal and foetal to maternal directions.[11] Even with increased concentration of glibenclamide above the therapeutic level, there were undetectable levels of the drug when analysed using high- performance liquid chromatography.[11] Similarly, glibenclamide was not detected in the cord serum of any infants in the study by Langer et al.[8] With the established information from the published data, we can recommend the use of glibenclamide to women with gestational diabetes who are reluctant to use insulin. However, more studies should be done to improve and supplement the established safety and efficacy data for the use of glibenclamide in pregnancy.

Metformin

Metformin inhibits hepatic gluconeogenesis and glucose absorption and stimulates glucose uptake in the peripheral tissues.[12–14] It also has an effect in reducting weight gain.[15] Many studies regarding metformin have been carried out in patients with polycystic ovary syndrome (PCOS). Jakubowicz et al. compared the pregnancy outcomes of 65 women with PCOS who became pregnant while taking metformin throughout pregnancy to 35 women who had PCOS and did not take metformin during pregnancy. The early pregnancy loss rate was low in the metformin group (8%) compared with the control group (42%).[16] In a similar fashion, Glueck et al. compared 33 non-diabetic women with PCOS who were on metformin during pregnancy with 39 non-diabetic women with PCOS without metformin therapy during pregnancy. The study noted a 27% incidence of gestational diabetesin the control group compared with 3% in the women who took metformin. Furthermore, there was no foetal malformation nor foetal hypoglycemia in the metformin group.[17] A larger controlled, randomised trial (the Metformin in Gestational Diabetes (MiG) study), compared 751 patients in two treatment arms.[18] One arm received metformin only, and the other had a supplement of insulin when the maximum metformin dosage of 2500 mg daily failed to achieve optimal glucose

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levels. The primary outcome was measured by neonatal hypoglycaemia, respiratory distress, need for phototherapy, birth trauma, Apgar score less than 7, or prematurity. There was no difference in the primary outcome between the two treatment arms (32% in metformin versus 32% in the insulin arm). In addition, fewer congenital anomalies were reported in the metformin group (11) as compared with the insulin group (18). Furthermore, more women using metformin indicated that their treatment was acceptable compared with those on insulin.[18] A 10-year retrospective analysis of pregnant women with type 2 diabetes in South Africa found that metformin alone was not associated with increased perinatal mortality.[19] Even in combination with glibenclamide, no increase in perinatal mortality was noted. When compared with insulin, metformin-treated pregnant women had low infant morbidity and mortality rates.[19] Hale et al. reported low concentrations of metformin in breast milk, with the mean infant exposure to the drug being 0.3% of the weight-normalised maternal dose, far below the 10% level of concern for breastfeeding.[20] A study in India concluded that metformin was safe either as an adjunct to insulin treatment or even as a monotherapy.[21]

Langer has suggested that OHAs (glibenclamide or metformin) may be appropriate for gestational diabetespatients with a fasting blood glucose (FBG) of 5.3–7.8 mmol/L or haemoglobin (HbA1c) levels of 7.0–8.0%. Below these levels, dietary treatments alone may be appropriate, and above these levels, insulin can be considered.[22]

Other oral agents

Apart from glibenclamide, other sulfonylureas such as tolbutamide and chlorpropamide cross the placenta, and thus pose a significant threat to the foetus.[23,24] No data are available regarding the safety and efficacy of pioglitazone, glipizide, and glimepiride.

Acarbose has been documented to be relatively safe in diabetic pregnancy. It acts primarily in the gut by delaying carbohydrate absorption, is not absorbed, and therefore has no systemic effect. A study by Bertini et al compared neonatal outcome in gestational diabetespatients treated with insulin, glibenclamide, and acarbose, and showed no statistical difference in fasting or postprandial plasma glucose (PPG) levels, and PPG levels or average newborn weight in the three groups.[25]

Rosiglitazone is not recommended in pregnancy due to adverse outcomes on the foetus in the mid and last trimester. A study by Chan et al. detected rosiglitazone in 19 foetal serum samples out of 31 pregnant women given the drug between the 8th and 12th weeks before surgical termination of pregnancy.[26]

Conclusion

Recent evidence has shown that glibenclamide and metformin are safe and useful in gestational diabetes patients who do not desire daily insulin injections. These oral agents are gaining acceptability by the medical community for use in gestational diabetes. They are particularly attractive in developing countries where the use of insulin may not always be possible. Being cheap and relatively easy to use, these agents may be considered as first-line treatment for gestational diabetes, reserving insulin as a second-line treatment in those cases where oral agents fail to achieve optimal glycaemic control. Glibenclamide has been shown not to cross the placenta and metformin has been documented in several trials to be safe for use in pregnancy. Given the available data, glibenclamide and metformin appear to be the best oral hypoglycaemic agents to use during pregnancy, and the current authors advocate the routine use of these agents in the management of gestational diabetes, especially in poorly resourced countries.

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Diabetes in Nigeria – a translational medicine approach

R N Oputa and S Chinenye

Introduction

The prevalence of diabetes mellitus in Nigeria has increased from 2.2% as reported by Akinkugbe in 1997 from a national survey to 5.0% by 2013 estimates of the International Diabetes Federation (IDF).[1,2] Complications of diabetes are common at the time of presentation in Nigeria: neuropathy 56%, erectile dysfunction 36%, nephropathy 9%, and retinopathy 7%.[3] This is partly because diabetes is a progressive illness with an initial asymptomatic phase associated with on-going tissue damage and decline in pancreatic beta cell mass and function.

The United Nations (UN) recognises diabetes as a chronic debilitating and costly disease associated with severe complications, which poses severe risks to families, member states and the entire world; and serious challenges to the achievement of internationally agreed developmental goals, including the Millennium Development Goals (MDGs).[4,5] The prevalence of the varying types of diabetes is increasing globally, including in Nigeria. Type 2 diabetes is increasing in adolescents, and gestational diabetes mellitus (GDM) is also more recognised now. Type 1 diabetes is often misdiagnosed or undiagnosed and may result in coma and death. Annual diabetes-related expenditure per patient in Nigeria is very low – US$137; this compares with US$4054 in Japan; US$3994 in the UK; and US$9800 in the UK.[2]

Translational medicine is a discipline within biomedical and public health research that aims to improve the health of the individual and the community by translating research findings into diagnostic tools, medicines, procedures, policies, and education. This article aims to analyse the various local and international studies and policies on diabetes mellitus with a view to providing preventive and care strategies for Nigeria. The Diabetes Association of Nigeria (DAN) has in the past few years harnessed local and international efforts on diabetes; leading a strong advocacy to the Federal Ministry of Health (FMOH) in Nigeria, to adopt international best practices to stem the tide of the diabetes epidemic in Nigeria.

Dr Reginald Nnamdi Oputa, Consultant Endocrinologist, Department of Medicine, Federal Medical Centre (FMC), Owerri, Imo State, Nigeria; Dr Sunny Chinenye, Consultant Endocrinologist and President of the Diabetes Association of Nigeria (DAN), Department of Medicine, University of Port Harcourt Teaching Hospital (UPTH), Port Harcourt, Rivers State, Nigeria. Correspondence to: Dr Reginald Nnamdi Oputa. Email: regoputa@yahoo.com

Epidemiology

Nigeria has the largest population in Africa (about 170 million); and of this the adult population (aged 20–79 years), is approximately 79 million.[2] One third of all the cases of diabetes are in the rural communities, while the rest are in the urban centres. About two million of the cases of diabetes in Nigeria are undiagnosed. Deaths related to diabetes in Nigeria in 2013 were estimated to be 105,091 cases.[2] Nigeria has the highest burden of diabetes in Africa, followed by South Africa with 2.6 million cases, Ethiopia 1.9 million, and Tanzania 1.7 million.

The global (whole world) prevalence of diabetes by 2013 estimates is 382 million cases, a large population of it (175 million) undiagnosed, and the global prevalence about 8.3%. More than half of the deaths due to diabetes occur in people less than 60 years old. Studies in Nigeria show that up to 73% of diabetes patients do not practice self-monitoring of blood glucose.[6,7] In a recent study the prevalence of hypertension and peripheral neuropathy in Nigeria was more than 50%, while the prevalance of retinopathy was 35%, cataract 25%, cardiovascular disease 5%, foot ulcers 16%, and nephropathy 3%.[7] It was obvious from this and other surveys that the status of glycaemic control and other targets such as lipids, glycated haemoglobin (HbA1c), blood pressure and education were below expectations.[7,8]

Risk factors

More than 95% of cases of diabetes in Nigeria are type 2 diabetes. Many cases of type 1 diabetes may die of acute complications, be misdiagnosed, or may not present to hospital due to poverty and lack of health insurance. Gestational diabetes is increasingly being recognised and diagnosed. Most antenatal clinics do glucose meter capillary blood glucose on the first antenatal visit. Diabetes has a strong genetic component, and this is even stronger in type 2 diabetes, which has links with insulin resistance and dyslipidaemia.[9-11]

A National Health and Nutrition Examination Surveys (NHANES) in the USA between 1976 and 2010 showed ethnicity/race, ageing, and obesity as the principal risk factors for type 2 diabetes.[12] The prevalence of diabetes in men rose from 4.7% to 11.2% during this period, and

from 5.7% to 8.7% in females. Body mass index (BMI) was found to be the major factor in the increased prevalence of diabetes.[12] In this study, physical activity, waist circumference and mortality were not measured, which may be a limitation. The various risk factors for type 2 diabetes are as outlined below:[12-14]

1. Unhealthy diet (fast food, excess refined sugar, excess salt, low fibre)
2. Overweight/obesity
3. Lack of regular physical exercise
4. Excessive use of alcohol
5. Advancing age
6. Hypertension
7. Family history
8. History of previous impaired glucose tolerance (IGT) or impaired fasting glucose (IFG)
9. Dyslipidaemia
10. History of GDM or large babies
11. Ethnicity

Diet

Food contains nutrients necessary for growth and health. However, a balance of the components of food and the energy needs of each person has to be worked out in order to maintain normal weight for height and sex. The macronutrients are carbohydrate, protein and fat. One gram of carbohydrate when metabolised gives 4 calories of energy and the same for protein; fat gives 9 calories, while alcohol gives 7 calories. However, alcohol has no nutrients and its metabolic products if in excess in the blood can damage cells and tissues.[15]

The micronutrients are vitamins and minerals. A balanced diet has all these nutrients. The World Health Organization (WHO) recommends that all people should limit the intake of refined sugar to less than 10% of the total calories, and those with diabetes should avoid all simple sugar. Daily salt intake should be less than 2.3 mg (one teaspoonful). Eight glasses of water are advocated (about 2.5 litres) daily. A fibre-rich diet helps the normal functioning of the gastrointestinal system and also helps to prevent weight gain and constipation. In addition, a fibre-rich diet reduces the glycaemic index of food items, thereby preventing post-prandial hyperglycaemia. WHO recommends 25–35 g (14 g/1000 calories) of fibre in food, daily. This is equivalent to 3–5 servings of vegetables and/or fruit daily.[15]

Good sources of fibre are oats, apples, oranges, wheat, garri, and vegetables. Fibre also reduces serum cholesterol, thereby reducing cardiovascular risks and mortality. A daily excess of 500 calories of energy will cause a weight gain of about 0.5 kg weekly. There are 3500 calories in 0.5 kg of stored fat. To lose weight in order to have a normal weight for height and sex, there should be a daily calorie deficit of at least 500 calories. This is best achieved by a combination of diet and regular exercise. A normal diet should contain the required calories for the patient to achieve normal weight in the following proportions: 50–60% complex fibre carbohydrate, 20–30% protein, 10–20% mono- and polyunsaturated fat, adequate vitamins and minerals.[15-17]

Glycaemic index (GI)

The glycaemic index (GI) is a measure of how quickly carbohydrate (CHO) is digested and absorbed into the bloodstream after ingestion. This is measured on a scale of 0–100. Pure glucose has a GI of 100. A GI of equal or less than 55 is low; 56–69 is medium, and equal or greater than 70 is high.[18] Low GI diets are generally recommended for diabetic patients, this helps to control appetite, delay hunger, and reduce post-prandial hyperglycaemia. The GI and calorie content of some Nigerian foods are shown in Tables 1–3.[15]

Food	Glycaemic index
Apple	38
Baked potato	85
Banana	55
Boiled potato	63
Brown rice	55
Coca Cola (regular)	63
Glucose	100
Honey	58
Mangoes	56
Milk	27
Orange	44
Pineapple	66
Orange juice	52
Table sugar	65
White rice	64
Yogurt (whole milk)	45

Table 1. Glycaemic indices (GI) of common foods

Food	Glycaemic index	Calories
White bread (1 slice)	70	84
Corn flakes (45g)	84	167
Beef burger (108g)	66	254
Banana (150g)	70	143
Chicken breast (140g)	55	162
2 Weetabix (37g)	69	129
Beer (600ml)	66	180
Cassava flour (100g)	59	341
Maize flour (100g)	55	370
Yam flour (amala) 100g	50	175
Whole wheat flour (100g)	70	345
Millet flour (100g)	68	345

Table 2. Glycaemic indices (GI) and calories of some Nigerian foods

Anthropometry

Measurement of body shape and weight, are important in understanding the changes associated with diabetes and other co-morbidities, such as described in the metabolic syndrome.[15-17] These can also be used to monitor

Food	Calories	Food	Calories
White bread	245	Beans	158
Brown bread	244	Plantain	64
Semolina	348	Tomato	23
Wheat flour	345	Mango	44
Soya beans	432	Potato	97
Greens peas	93	Sweet potato	120
Cabbage	27	Tapioca	157
Lettuce	21	Yam	111
Carrot	48	Cucumber	13

Table 3. Caloric values of some foods per 100g

treatment and the patient's response to diet, exercise, and drugs. The measurements include height, weight, body mass index (BMI), waist circumference (WC), hip circumference (HC), waist hip ratio (WHR), and saggital abdominal diameter (SAD).

(a) Weight. Weight could be low, normal, or high. If high it is classified as overweight or obese. Weight is often related to age, sex, and height. A man with a height of 1.70 m will have an ideal weight of about 70 kg, and with a height of 1.80 m, this will be a weight of about 80 kg. This is sometimes called the Brocas index. Weight in excess of 10% above ideal is described as overweight and more than 20% over the ideal weight is classified as obese.[15]

(b) Body mass index (BMI). Also called the Quetelet's index, the BMI is derived from the individual's weight in kilograms, divided by their height in metres squared. The normal range is 18.5–24.9 kg/m^2. BMI values below 18.5 suggest underweight and/or malnutrition. From 25.0–29.9 is overweight, 30–39.9 is obese, while 40.0 and above is severe obesity. BMI, however, as a measure of excess weight does not differentiate lean body mass from fat.

(c) Waist circumference (WC). Excess fat around the midriff or trunk is associated with cardiovascular disease. However, this does not differentiate subcutaneous fat from visceral fat. Excess visceral fat generates injurious inflammatory chemicals such as cytokines and adipokines. It is measured at the widest abdominal girth, which is about the umbilicus, or at the midpoint between the lower margin of the ribs and the upper margin of the iliac crest. For males, a WC greater than 102 cm is abnormal, while values greater than 88 cm in females are abnormal. These values have been reviewed recently, and values above 94 cm for males and 80 cm for females are now considered abnormal.[16,17]

(d) Waist to hip ratio (WHR). The normal WHR for females are values less than 0.9, and in males less than 1.0. Some clinicians use lower cut off points for males (less than 0.9), and for females less than 0.8.[17,19]

(e) Saggital abdominal diameter (SAD). This is a more recent measurement that correlates well with the measurement of visceral adiposity using imaging techniques. The patient is placed in the supine position, a position that ensures that the subcutaneous fat gravitates to the sides making it easy to measure the visceral fat across the abdominal diameter.[15]

Prevention of diabetes

The prevention or steady decline in the prevalence of diabetes in Nigeria will entail a multisectoral, co-ordinated, monitored, and well-funded programme as advocated by the IDF, WHO, DAN and other bodies.[20-22] DAN has championed a lot of activities, such as the provision of a National Guideline for Diabetes Management in Nigeria, which the Federal Ministry of Health of Nigeria has acknowledged as a working tool.[3] DAN as a member of the IDF produced and launched a book in 2013.[23] DAN has also started a training curriculum for health workers in Nigeria – the first edition was held at Abuja in November 2013. The following was advocated to reverse the increasing prevalence of diabetes in Nigeria:

1. National survey every 5 years to determine the burden and pattern of diabetes.
2. Diabetes health education in primary and secondary schools (with emphasis on nutrition, exercise, and healthy lifestyle).
3. National plan for good diet, avoiding smoking and excess alcohol.
4. Checking of blood glucose yearly from age 30 years.
5. Checking blood pressure yearly from age 25 years.
6. Checking serum cholesterol profile yearly from 35 years.
7. Eye examination every 5 years.
8. Compulsory and free primary education nationally.
9. An increase of health insurance coverage from the current less than 5%, to 50% in the next 5 years.
10. Making health and physical education a compulsory and practical course at primary and secondary school level.

Treatment recommendations

1. Universal and free primary healthcare for all Nigerians, provided by Local Governments. This would fulfil the recommended care in the IDF Clinical Guideline 2012.[21]
2. Free Secondary Health Care, provided by State Governments. This is also in line with the care recommended by IDF Guidelines of 2012.[21]
3. Tertiary healthcare covered by a National Health Insurance Scheme (NHIS), provided by the Federal Government of Nigeria, and consistent with the comprehensive care stated in the IDF Guidelines.[21]

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Prevalence of prediabetes in secondary school students in Port Harcourt, Nigeria

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Abstract:
This study aimed to assess the prevalence of prediabetes using impaired fasting glucose (IFG) in secondary school students aged 10 to 19 years in Port Harcourt, Nigeria, and to determine associated risk factors. Fasting blood glucose (FBG), blood pressure (BP), and body mass index (BMI) was measured. All students who had a FBG of 5.6 - 6.9mmol/l were asked to undergo an oral glucose tolerance test (OGTT). A total of 880 students were studied. The prevalence of IFG using the International Society for Paediatric and Adolescent Diabetes (ISPAD) criteria was 17% and prevalence was comparatively higher in subjects who were obese, had systolic prehypertension or diastolic hypertension, as well as a family history of diabetes. There was, however, no statistical association between the BMI percentile categories, BP category, sex and age category, or family history of diabetes and occurrence of IFG. The prevalence of IFG was 4% using the World Health Organization (WHO) criteria. Only one child had diabetes. Sixty-six (42%) students who had IFG had an OGTT, of which 10(15%) had IGT. We conclude that prediabetes is common in this population, and screening should be considered, at least in those with obesity or a family history in diabetes.

Introduction

There is a current worldwide increase in prevalence of type 2 diabetes in children, especially amongst adolescents. Studies mainly from America show that type 2 diabetes represents 8 to 45% of new cases of diabetes in children and is commonly diagnosed between the ages of 12 and 16 years.[1] This increase in prevalence has been well documented in the United States of America, especially among minority groups, and groups with a high incidence of obesity.[2,3] In Africa, 12.1 million people were estimated to be living with diabetes in 2010, and this is projected to increase to 23.9 million by 2030, with type 2 diabetes accounting for most cases.[4]

The onset of type 2 diabetes is usually preceded by an asymptomatic preclinical state known as prediabetes. Prediabetes is marked by IFG or IGT, associated with resistance or deficiency of insulin.[5] The prevalence of prediabetes ranges in adults from 2.2% to 16.2% with a prevalence of 7.3% in sub-Saharan Africa.4 The prevalence amongst US teens has progressively increased from 9% in 2000 to 23% in 2008.[6] In a cross-sectional study amongst Hispanic children in the USA with a history of obesity and a family history of type 2 diabetes, the prevalence of prediabetes was 32%.[7]

Risk factors associated with the development of prediabetes and diabetes include obesity, overweight, family history, acanthosis nigricans, hypertension, polycystic ovarian syndrome and hyperlipidaemia.[8] In a study by Mbanya et al, a significant proportion of the offspring of Cameroonians with type 2 diabetes had either type 2 diabetes (4%) or IGT (8%).[9] Although prediabetes has been documented commonly in the obese, it has also been noted amongst the non-obese.

The transition from prediabetes to diabetes may take many years, but may occur rapidly. In some cases, there may be reversal with adequate life style modification.[10]

Most of the studies done on prediabetes in Africa are in adults, and little is known about the prevalence in children and adolescents. The purpose of this study was to determine the prevalence of prediabetes in secondary school students, aged 10 - 19 years in Port Harcourt, Nigeria using IFG, and to determine associated risk factors.

Patients and methods

This was a cross sectional study carried out amongst students in public secondary schools in Port Harcourt Local Government Area (LGA) of Rivers State, Nigeria over a two-month period, March 2013 to May 2013. Port Harcourt is the capital of Rivers State, a major industrial area of the Niger Delta region of Nigeria, with much oil exploration and urbanisation. Rivers State has an estimated population of 5.3 million, using the 2006 census with Port Harcourt LGA accounting for 541 115 of the state population covering a land area of 109km2.

Ethical approval for this study was obtained from the Ethics committee of the University of Port Harcourt Teaching Hospital and from the Rivers State Ministry of

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Variable	Number (%)	IFG (FBG 5.6-6.9mmol/l)
Age		
10-12.9 y	139 (16%)	27 (19%)
13-15.9 y	418 (47%)	80 (19%)
16-19.0 y	323 (37%)	45 (14%)
Gender		
Female	577 (66%)	99 (17%)
Male	303 (34%)	53 (17%)
Weight		
Underweight	20 (2%)	3 (15%)
Normal weight	736 (84%)	117 (16%)
Overweight	101 (11%)	24 (24%)
Obese	23 (3%)	8 (35%)
Systolic BP		
Normal	750 (85%)	124 (17%)
Prehypertension	72 (8%)	16 (22%)
Hypertension	58 (7%)	12 (21%)
Diastolic BP		
Normal	745 (85%)	126 (17%)
Prehypertension	105 (12%)	19 (18%)
Hypertension	30 (3%)	7 (23%)
Family history of diabetes		
Yes	99 (11%)	24 (24%)
No	781 (89%)	128 (16%)

Note:
1. Underweight was below the 5th BMI percentile, normal weight 5th-85th percentile, overweight 85th-95th percentile, and obese >95th percentile.
2. Normal BP was <90th percentile for age and sex, prehypertension was 90th-95th percentile, and hypertension was >95th percentile.

Table 1. Demographic characteristics and impaired fasting glucose status of school children

Education. Permission was also obtained from individual head teachers of schools selected, and consent was obtained from students and parents.

Schools and students were selected using multistage sampling from a list of schools provided by the Rivers State Ministry of Education. The sample size was calculated using a prevalence of 50%, because no other study has been done in this region in children. A minimum sample size of 1180 was determined and recruited following which 880 students met inclusion criteria and were analysed. Students who were known to have diabetes, those who did not fast for the FBG determination, and those whose parents did not give consent, were excluded.

A pretested self-administered questionnaire was used to obtain information on family history of diabetes. Blood pressure and anthropometric data, which included weight, height and BMI, were determined using appropriate methods by pretrained field assistants. BMI percentiles were determined for each subject based on age and sex and categorised into underweight, normal weight, overweight and obesity. BP percentiles based on age and sex were also determined and classified into prehypertension, hypertension and normal blood pressure.

FBG was determined for recruited subjects following an 8 to 12 hours overnight fast, using the Accu-chek Active Roche Diagnostics glucometer. Quality control of the glucometers was done using Accu-chek control solutions daily to ensure correct results. Results were classified based on the ISPAD or WHO criteria into normal, impaired fasting, and diabetic range glucose levels. Analysis in this report was based on the ISPAD criteria because previous studies have used these values and reports have shown that complications of prediabetes have been recorded with blood glucose as low as 5.6mmol/l, as advocated by ISPAD. According to ISPAD criteria, IFG is FBG of 5.6 - 6.9mmol/l (100 -125mg/dl) and WHO criteria of IFG is FBG of 6.1-6.9mmol/l (110 -125mg/dl).[11,12]

All results were recorded into respective students questionnaire and data entered into an Excel sheet and analysed using SPSS version 17. Frequency distributions and cross tabulations were used and prevalence of prediabetes was computed. Significance levels were determined by the Chi square test and level of statistical significance was considered at a p value of <0.05.

Results

Eight hundred and eighty (880) students aged 10 to 19 years were analysed. There were 577 (66%) females and 303 (34%) males. The mean age of students studied was 15±2 years. There was no statistically significant difference between the mean age of males and females. Table 1 shows the demographic data.

The mean FBG was 5.2±0.5mmol/l. Overall, 17% of students were identified to have IFG based on the ISPAD criteria, with an equal sex distribution. Using WHO criteria, the IFG prevalence was 4%, and one subject had diabetes.

The relationship between age, gender, weight category, blood pressure and family history of diabetes with IFG is shown in Table 2. The data showed that there was no statistically significant difference in the prevalence of IFG with age, sex, weight category, blood pressure and family history. Thirty-two (26%) of the overweight and obese students had IFG, compared to 117 (16%) of normal weight students ($p= 0.156$). The prevalence of IFG was 21% and 19% in those with systolic and diastolic prehypertension and hypertension respectively.

Twenty-four (24%) of students a with family history of diabetes had IFG compared to 16% without. This difference was not statistically significant.

Sixty-six (43%) of students with IFG accepted to under-

take an OGTT, out of which 10 (15%) had IGT. The prevalence of prediabetes was higher using the ISPAD criteria (17%) compared to use of the WHO criteria (4%).

Discussion

The prevalence of prediabetes depends on the definition used.[14] Significant differences in prevalence can depend on whether prediabetes is defined by IFG or IGT, as well as on the age and ethnic group of the patients and the criteria used.[13] Prediabetes in students in public secondary schools in our study using the ISPAD criteria was highly prevalent. In the few school-based studies, prevalence of prediabetes using IFG was estimated to vary from 6.7% to 40.5%.[14-17] In this study the prevalence of prediabetes using IFG was 17%. This is similar to a report by Aboulella et al in Egypt of 16% but lower than reports of 23% from Jordan.[15,16] In an earlier report, prevalence of prediabetes amongst US adolescents aged 12 to 19 years using IFG was 13%.[18] Also, in a study in Mexico amongst 1534 apparently healthy children aged 6 to 18 years, prevalence of prediabetes using IFG was 18.3%.[19] The difference in prevalence of IFG in different studies may be due to differences in environmental risk factors, genetic, socioeconomic factors, prevalence of other associated risk factors for prediabetes and diabetes, and the method of blood glucose determination. The use of IFG in the determination of prediabetes in this study is according to the recommendation of the ISPAD. IFG accounted for nearly 80% of adolescents with prediabetes in most studies.[18,20] The prevalence of prediabetes using IGT amongst adolescents is lower than prevalence using IFG in most studies.[18,20,21] The prevalence amongst USA adolescents aged 12 to 19 years, was 13% using IFG and 3% when IGT was used. The difference in prevalence shows that the tests represent different aspect and different stages of progression of glucose dysregulation. Although this study did not set out to test for IGT in all children, however 10% of the 66 children with IFG who accepted to do the OGTT had IGT.

	IFG	No IFG	Significance
Total	152 (17%)	728 (83%)	
Gender			**p=0.769**
Male	53	250	
Female	99	478	
Age group			**p=0.260**
10-12.9 y	27	112	
13-15.9 y	80	338	
16-19.0 y	45	278	
Weight category			**p=0.156**
Underweight	3	17	
Normal	117	618	
Overweight	24	77	
Obese	8	15	
Systolic BP			**p=0.668**
Normal	124	625	
Prehypertension	16	55	
Hypertension	12	46	
Diastolic BP			**p=0.910**
Normal	126	617	
Prehypertension	19	85	
Hypertension	7	23	
Family history			**p=0.142**
Yes	24	75	
No	128	653	

Note:
1. Underweight was below the 5th BMI percentile, normal weight 5th-85th percentile, overweight 85th-95th percentile, and obese >95th percentile.
2. Normal BP was <90th percentile for age and sex, prehypertension was 90th-95th percentile, and hypertension was >95th percentile.

Table 2. Association of age, gender, weight category, blood pressure and family history of diabetes by IFG

The prevalence of prediabetes has been found to be high among adolescents with obesity.[16-18] The twofold increase in prevalence of IFG over a five year period in the NHANES study between 1999 to 2006 was attributed to the rapid rise in the prevalence of obesity amongst adolescents. In our study, although there was no statistically significant difference in the prevalence of prediabetes between normal weight and overweight or obese students, the prevalence of IFG was higher amongst overweight and obese subjects. This finding has been reported by D'Narayanappa and colleagues[17] in Indian prepubertal children, and Aboulella and colleagues.[17] In the study on 'STOPP' type 2 diabetes, conducted amongst 8th grade students with a mean age of 14 years, 40% had IFG. In those with a BMI ≥ 95th percentile, the prevalence of IFG increased to 47%, while it was 36% in students with normal BMI (<85th percentile[14]). The reason for the high prevalence of prediabetes in overweight and obese subjects may be due to the presence of insulin resistance and toxicity to beta cells due to the high level of free fatty acids in obese individuals.[22] In our study, no association was found between prediabetes and overweight or obesity as reported in other studies.[14,15,17] The reason for lack of association cannot be ascertained, but it is a known fact that insulin resistance can be seen in both the obese and non-obese.[22]

The risk of developing prediabetes and type 2 diabetes

in obese children depends on genetic factors, onset of puberty, developmental and nutritional factors.[22] Based on genetics, family history of diabetes is a strong factor for development of IFG even in the absence of obesity.[11] In our study, the prevalence of prediabetes was higher in children with a positive family history of diabetes. In a study of children and adolescents aged 7-15 years from Mexico, IFG was identified in 88% of those with a family history, compared to 2% of those without; and the presence of family history in a first degree relative was associated with IFG, even in the absence of obesity.[23] Similarly, among obese children from Germany, a history of parental diabetes was associated with a 9.5 fold increased risk for prediabetes, making family history of diabetes a very important risk factor for development of prediabetes and type 2 diabetes.[24]

As with other associated risk factors for cardio-metabolic diseases evaluated in this study, the prevalence of both systolic and diastolic blood pressure increase was noted to be higher in students with prediabetes. Although there was no statistically significant association between raised BP and prediabetes, the findings in this report may indicate a clustering of risk factors.

Adolescents aged 12-15 years have been reported to have a significantly higher rate of prediabetes than those aged 16 to 19 years.18 This may be related to the pubertal insulin resistance that occurs during early adolescence.[13] In this study, although there was no specific look at the Tanner stages for the students studied, there were proportionately higher numbers of children with prediabetes amongst those in early and mid-adolescence, also coinciding most likely with early Tanner stages. The higher prevalence may therefore be accounted for by higher insulin resistance recorded in early adolescence.[13]

We conclude that prediabetes is prevalent in secondary school students in Port Harcourt, Nigeria. It was commoner in subjects with overweight or obesity, prehypertension and hypertension, and a family history of diabetes. There was no statistically significant association with prediabetes and any evaluated risk factor. However, screening for prediabetes will be helpful in adolescents who have a family history of diabetes, or have hypertension, or obesity.

Acknowledgement

We wish to acknowledge all the field staff and students who participated in this study. Thanks go to our families and employers and to all the tutors at the Paediatric Endocrinology Training Centre for West Africa, Lagos University Teaching Hospital and its sponsors for the training in the subspecialty. Special appreciation to ISPAD and the European Society for Paediatric Endocrinology (ESPE) for part sponsorship of the study.

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Knowledge and impact of diabetes in patients in a tertiary clinic in Southeast Nigeria

E O Achigbu, R N Oputa, K I Achigbu, and I U Ahuche

Abstract

Diabetes mellitus is a chronic non-communicable disease (NCD) of public health importance, as it has become a global epidemic requiring the efforts of caregivers and patients for effective management and prevention. This has necessitated the inclusion of diabetes education as an essential component of diabetes care. The aim of this study was to determine the knowledge of diabetes and the impact of this knowledge on patient management, with a view to making recommendations on how to improve management and treatment outcomes.

This was a prospective cross-sectional study including all previously diagnosed patients with diabetes who attended the Outpatient Endocrinology Clinic of the Department of Internal Medicine, Federal Medical Centre, Owerri, Imo state, Nigeria during the period of the study. One hundred and three (103) subjects consisting of 44 males and 59 females aged 20–80 years participated in the study. Most had had diabetes for 5 years or less, and about 40% did not know what diabetes meant. Approximately 80% knew the names of their drugs. Diet was the only lifestyle modification adopted by the respondents. They had good social disclosure attitudes.

In conclusion, the patients displayed a good knowledge of the drugs used in their management, and a positive impact of their knowledge in the area of diet control and disclosure attitudes. There was still a poor knowledge of the cause of diabetes, which cannot easily be overlooked, as it is significant to the total management of the patient. A nationally adopted programme of structured education for people with diabetes is recommended.

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Introduction

Diabetes mellitus is a chronic non-communicable disease (NCD) which has become a global epidemic.[1,2] Diabetes education and diabetes self-management education, as well as on-going support, are essential components of diabetes care. Patient participation is crucial in the management of diabetes. Education empowers people living with diabetes to manage their disease, improve health goals and outcome, as well as contributing to the care of other patients.[3,4] Different aspects of diabetes management demand lifestyle changes, self-monitoring of treatment, and prevention of complications.[5,6]

A joint initiative of the World Health Organization (WHO) and International Diabetes Federation (IDF), 'Diabetes Action Now', aims to stimulate and support the adoption of effective measures for surveillance, prevention, and control of diabetes; as well as to achieve a substantial increase in global awareness about diabetes and its complications. It has 19 healthcare domains – screening and diagnosis, care delivery, education, psychological care, lifestyle management, glucose control level, clinical monitoring, self-monitoring, oral therapy, insulin therapy, blood pressure (BP) control, cardiovascular (CV) risk protection, eye screening, kidney damage, foot care, nerve damage, pregnancy, children, and in-patient care.[5] Self-management education provides knowledge and practice of all the various aspects of diabetes care and support.

Therefore, health workers must be trained on a regular and continuous basis to impart the correct information on diabetes, and also provide general information on networking and health systems. Some countries such as Canada, the USA, and Australia provide standard courses for certified diabetes health educators (who undergo regular recertification) to ensure that such educators have current best practice knowledge and skills.[7] The use of diabetes guidelines and standards to teach people living with diabetes can improve health outcomes[8–10] of patients.

This study aimed to determine the knowledge of diabetic patients attending the Diabetes Clinic of the Federal Medical Centre, Owerri, Nigeria on diabetes, drug use, co-morbidities, causes, complications, and psychosocial factors; with a view to making recommendations on

how to improve management and treatment outcome.

Patients and methods

This study was carried out in the Outpatient Endocrinology Clinic of the Department of Internal Medicine, Federal Medical Centre, Owerri, Imo State, Nigeria. It included all previously diagnosed patients with diabetes who attended the clinic during the period of the study. This was a prospective cross-sectional study using a structured questionnaire comprising open and closed questions. It captured information on the biodata of respondents, their medical history, and their knowledge, perception, and attitude to diabetes. Data were collected using a questionnaire administered by the interviewer. The questionnaire was divided into four parts:

1. Section A: Biodata of subjects including their age, sex, and occupation.
2. Section B: Medical history of subjects.
3. Section C: Perception and understanding: this section sought to elicit the subject's view and knowledge of their illness.
4. Section D: Attitude to illness. This consisted of questions concerning the subject's lifestyle changes or behaviour attributed to their illness.

Data collected was analysed using SPSS version 20 (2012) and presented in tables and charts. Institutional consent was obtained in writing from the Federal Medical Centre Ethics Committee. In addition, informed verbal consent was obtained from each subject who participated in the study after detailed explanation.

Results

One hundred and three (103) subjects consisting of 44 males and 59 females (ratio 1.0:1.3) participated in the study. There were 21 (20%) aged 20–50 years, and 82 (80%) aged 51–80 years. Forty-three (43) were unemployed (42%), 30 (29%) were in business, 14 (13%) were farmers, 12 (12%) were civil servants, and 4 (4%) were artisans. Most (69%) had had diabetes for less than 5 years, 22% had had diabetes for 6–10 years, 5% for 11–15 years, and 4% for 16–20 years.

Slightly over half of the respondents (56%) knew diabetes was an excess of sugar in the blood, 38% did not know what diabetes was, while 5% and 1% respectively thought it was caused by hypertension or pregnancy.

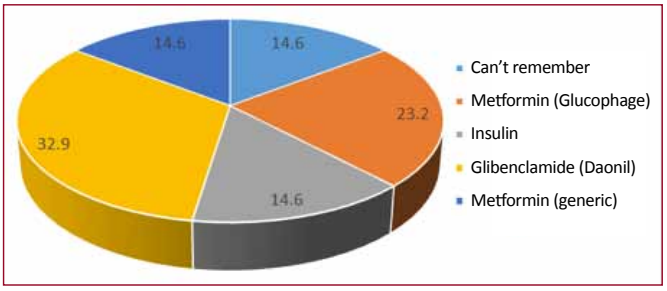

Figure 1. Drugs used by the respondents

Sixty-seven (67) respondents (65%) saw diabetes as just an illness, 21% thought it was a spiritual attack, while 14% believed it was an inherited disorder.

Figure 1 shows the patients' reporting of the treatment they were taking. Eighty-two (80%) of subjects knew the names of their drugs and most (83%) were on oral hypoglycaemic agents. Daonil (glibenclamide) was the most prescribed drug (33%). Knowing the names of their prescribed drugs was significantly associated with the duration of illness (p=0.023).

Knowledge of complications of diabetes was not influenced by age or sex of the respondents. Hypertension was the most common co-morbidity (58%) and it was not associated with duration of diabetes (p=0.460). Diet modification (92%) was the only change in lifestyle adopted by the respondents. This change was also not dependent on age (p=0.564) or sex (p=0.756).

Almost all (98%) of respondents irrespective of age had disclosed their illness to family and friends. This disclosure was to make relatives aware and encourage them to be screened for diabetes (52%). The remaining respondents (47%) disclosed their disease in order to get financial support to enable them to purchase drugs. The decision to disclose the disease to others was not significantly related to the duration of diabetes (p=0.821) or the age of the patients (p=0.143).

Discussion

The peak age for type 2 diabetes in most studies is between 41 and 60 years,[11–13] and the peak age in this study was similar. Most cases of type 2 diabetes present after the age of 40 years, irrespective of the fact that the disease may have remained unrecognised and undiagnosed for years.

Most of our subjects were unemployed and dependent on their families; the self-employed consisted of business people, artisans and farmers, and civil servants. The civil servants worked for the government and were usually the only group with access to some form of health insurance. Therefore most patients were unable to meet the high cost of the management of diabetes. The mean diabetes-related expenditure per person with diabetes in Nigeria is US$137 which is very low when compared with expenditure for Denmark (US$7272), the United Kingdom (US$3994) and the USA (US$9800).[11] Poverty, ignorance, and inability to access healthcare provide the obvious factors that account for the high rate of morbidity and mortality among diabetic patients in our environment.[11–14]

The duration of diabetes from the time of diagnosis was mostly less than 5 years. Increase in mortality rate associated with long-standing diabetes and its complications or decline in clinic attendance may be responsible for this drop.

A high level of ignorance about diabetes is common in Nigeria and in most of Africa.[15-18] Almost 40% did not know the cause of diabetes, while a few attributed it to pregnancy and hypertension. It is however heartwarming to note that the majority of the subjects saw diabetes as an illness as opposed to a spiritual attack. This perception may be attributed to the regular health talks given

in our diabetic outpatient clinic.

The knowledge of the drugs used was high and increased with duration of diabetes. This may also be a result of the clinic-based health talks on diabetes. It supports the need for continuous education in the management of patients.

The most common drug used in our subjects was metformin (as 'Glucophage' or generic metformin) followed by 'Daonil' (glibenclamide). A small proportion used insulin (15%). Hypertension was the most common co-morbidity noted in this study and was not associated with the duration of diabetes. Essential hypertension is very common in this environment and may not necessarily result from diabetes as a complication.[19,20] Some of the subjects may have been diagnosed as being hypertensive many years before developing diabetes.

Knowledge on diet as a major form of diabetes management was high (92%) and this is similar to the findings in other studies.[12–14] Most people in Nigeria, in both urban and rural areas, have access to natural food products high in complex fibre such as cassava, rice, yam, beans, and vegetables. Also, most people in rural areas practice subsistence farming. Diet control is therefore primary in diabetes management in this environment.

The attitude of the patients towards disclosing their illness is impressive, even though about half of them did that to get financial support. The role of poverty in the rates of morbidity and mortality of people with diabetes cannot be overemphasised.

In conclusion, we found a good knowledge of the drugs used as well as the role of diet in the management of diabetes, but a high level of ignorance about the cause of diabetes. This ignorance may very well affect the attitude of these patients towards their illness, especially in the face of poverty. People living with diabetes should have enough knowledge to aid their management, and help prevent future complications.

There is a need to institute a well-funded and monitored Diabetes Self-Management Education (DSME) and Diabetes Self-Management Support (DSMS) programme in our health facilities. There is also the need to train diabetes educators in well-established and recognised institutions[21–24] in order to foster diabetes prevention and care.

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Age at diagnosis and duration of type 2 diabetes seen in Benin City, Nigeria

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Abstract

It has been reported that type 2 diabetes is occurring at an earlier age than previously. We have therefore studied the age at diagnosis and duration of type 2 diabetes among Nigerians. There were 732 patients studied, of whom 467 (64%) were female. Mean age was 58±11 years, and mean diabetes duration was 5±5 years. The commonest age at diagnosis was in the fifth decade and 69% of the patients had been diagnosed within the last 5 years. This may be due to increased rates of diagnosis of diabetes, or high mortality in those with a longer duration of diabetes.

Introduction

Diabetes mellitus is a chronic metabolic disorder that has assumed pandemic proportions.[1] It is associated with significant morbidity and mortality, and its prevalence in Nigeria is about 2.2%.[2] The numbers of type 2 diabetic patients seen in our clinic is on the increase, and the condition is now believed to be occurring at a much earlier age than previously. However, there are insufficient data to support this trend. The age at diagnosis of type 2 diabetes is undocumented in our practice area, and the aim of this study was therefore to document the age at diagnosis of type 2 diabetes patients seen in two Diabetes Clinics in Benin City, Nigeria.

Patients and methods

This study was a retrospective study, and medical records of all type 2 diabetic patients seen at our Diabetes Clinics over a 60-month period were examined. Patients whose age at diagnosis of diabetes was 30 years and above were included in the study. Data extracted and recorded included age, age at diagnosis of diabetes, duration of diabetes, gender, history of hypertension, family history of diabetes, blood pressure, occupation, and anthropometric indices – waist circumference and body mass index (BMI). Fasting plasma glucose was also measured. Diabetes was defined according to the 1999 American Diabetes Association criteria.[1] Using World Health Organization criteria,[3] generalised obesity was classified as a BMI >30.0 kg/m^2 in both genders. Statistical analysis was carried out using the Statistical Package for Social Sciences (SPSS) software version 16. Data were expressed as means ± standard deviation (SD). Comparison of means was done using Student's *t*-test for continuous data. The level of statistical significance was set at $p<0.05$.

For the purposes of this study, the 'young' age group was defined as those younger than 45 years old; 'middle age' was 45–64 years, and the 'elderly' age group was older than 65 years.

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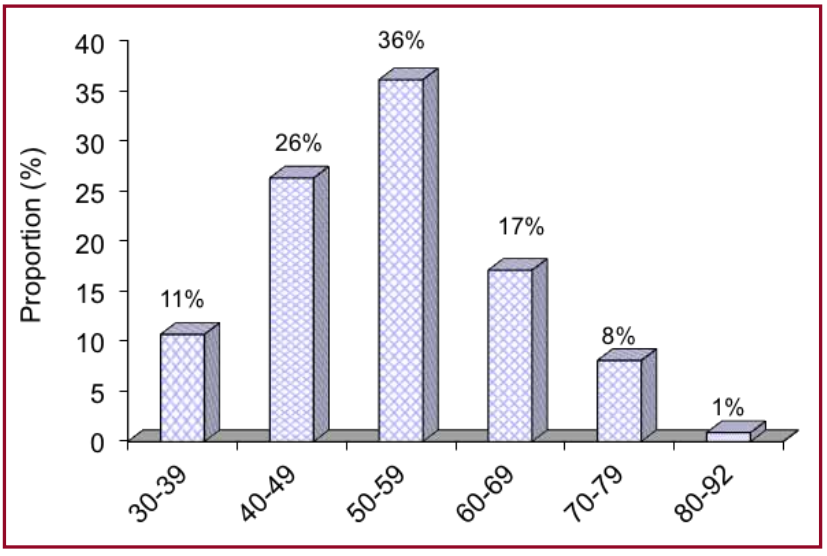

Figure 1. Proportion of type 2 diabetic patients by age

Results

The study population consisted of 732 patients with type 2 diabetes, of which 467 (64%) were female, giving a female to male ratio of 1.8:1.0. The mean±SD age at diagnosis of diabetes was 53±11 years (range 30–92 years). The distribution of patients by 10-year age groups is shown in Figure 1, and Figure 2 shows the diabetes duration. It can be seen that most patients (60%) were in the age range 40–59 years, and that 69% had a diabetes duration of less than 5 years. Mean age was 58±11 years, and mean diabetes duration was 5±5 years. The age at

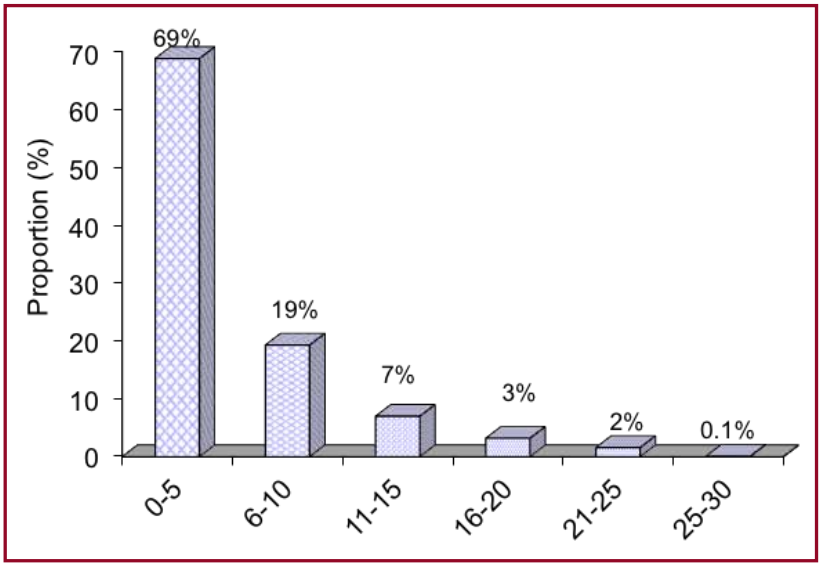

Figure 2. Proportion of type 2 diabetic patients by duration of disease

diagnosis was in the elderly group for 15% of patients, in middle-age in 61%, and in the young age group for 24% of patients. There was a family history of diabetes in 171 (23%) patients. Hypertension was present in 298 (40%); mean systolic blood pressure (BP) was 133±21 mmHg, and diastolic BP 82±12 mmHg. Mean BMI was 28.3±5.2 kg/m^2 and 187 (25%) patients were obese. Mean waist circumference (WC) was 96±12 cm. Mean fasting plasma glucose was 11.1±6.0 mmol/l.

Comparing parameters by gender, there was a significant difference only for BMI and WC. BMI was 26.7±4.2 in males and 29.1±5.5 in females (p=0.001). WC was 93±11 in males and 97±12 in females (p=0.001).

Discussion

The study showed that onset of diabetes was mainly in middle age, with a peak age at diagnosis in the fifth decade of life, and a mean age at diagnosis of 53 years. This finding is comparable to that of 54±14 years reported by Harzallah et al[4] in Tunis but less than the 56±11 years reported by Winkley et al[5] in London, and 59 years by Corona et al[6]. The finding that the occurrence of type 2 diabetes was commonest (36%) in the 50–59 years age group was similar to the finding of 32% by Zaman and Borang in a rural area of India.[7]

Almost 70% of our patients had a duration of diabetes of 0–5 years, and 88% had developed the disease within the last decade. This finding may be due to increased diabetes awareness, screening for diabetes, and early diagnosis of new cases within the last decade. It may also suggest a genuine increase in new cases. There is a possibility that patients with a longer duration of diabetes may die of diabetes or its complications, thus accounting for the relatively few cases of long-standing diabetes in resource-challenged areas such as ours.

Diabetes management is largely paid for out of pocket in our environment. There is also a lack of adequate diabetologists and other trained personnel to manage diabetes. In conclusion, the commonest age at diagnosis of type 2 diabetes was in the fifth decade in our environment. Duration of diabetes was low, possibly due to an increase in new diagnosis, or to premature mortality.

Acknowledgement

Part of this article was presented as an abstract entitled 'Age of onset of type 2 diabetes mellitus in Nigerians: is it decreasing?' at the World Diabetes Congress organised by the International Diabetes Federation in Montreal, Canada in 2009.

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Guidance to Authors

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.

Manuscripts

Review articles

These are particularly welcome as we receive relatively few. They can be on any aspect of diabetes, though preferably of general interest to our readers. Review articles do not need an abstract, and should be no more than 2500 words long (excluding references). A reasonable number of figures and/or tables can be used.

Original articles

These should be research-based articles, divided in a standard way into abstract (unstructured), introduction, methods, results and discussion. In length they should be no more than 2000 words (excluding references) with no more than three tables or figures, and 30 references.

Short reports/case reports

These should be up to 800 words long (excluding references), have one table or figure only, and up to 10 references. The sub-divisions of the report should be the same as for original articles, but the abstract should be very brief – usually two or three sentences.

Letters, news and notes, editorials etc.

We welcome news items, conference reports, letters to the editor, etc. We normally write editorials 'in house', but if you think you have a useful editorial to offer, we'd be glad to see it.

Illustrations

These must be supplied as jpeg, tiff or PDF files, in CMYK format with a resolution of at least 300 d.p.i.

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Articles should be sent by email – to our Cambridge office (editor@fsg.co.uk) – as a Word attachment (saved as a text-only document please). For all contributions referencing should be numerical and in the Vancouver style. Please note that all articles submitted to the *African Journal of Diabetes Medicine* are deemed to have been offered exclusively to the journal, unless otherwise stated. Copyright in papers published will be vested in the publishers.The Editors reserve the right to shorten or to make other alterations to articles at their discretion.