

Research Article

Prevalence of chronic complications of type 2 diabetes mellitus in a secondary health centre in Niger Delta, Nigeria

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ABSTRACT

Background: Type 2 diabetes mellitus (T2DM) in Nigeria is believed to rapidly be on the increase despite its awareness. Its related chronic complications is also expanding leading to reduction in the quality of life of patients, incurring heavy burdens to the health care system, loss of man hours from work and increasing diabetic mortality. Current information on the prevalence of chronic complications and its related clinical characteristics in Niger Delta area is scarce. The aim of this study was to determine the prevalence of chronic complications of type 2 diabetes mellitus in a secondary health Centre in Niger Delta, with the objective of relating the effect of age and gender with these complications as well as determining their glycemic control.

Methods: 200 consenting adult diabetics 96 (48%) males and 104 (52%) females, who have been attending the diabetic clinics for at least 12 months, were randomly recruited for the study. Hospital records, questionnaire and laboratory investigations were used to collect the demographic, clinical data as well as values of fasting blood sugar, urea, creatinine, lipids, urine microalbumin and glycated hemoglobin for all subjects.

Results: Of the 200 T2DM patients evaluated for chronic complications, 130 (65%) presented with one form of complication varying from nephropathy (58%), dyslipidemia (57%), hypertension (48%), neuropathy (14%) and retinopathy (9%) with 104 (52%) having more than two categories concurrently. chronic complications varied with gender as well as age.

Conclusions: Chronic complications are common among type 2 diabetes in central hospital Warri, Nigeria. Implementation of timely and appropriate screening strategies could decrease the burden of diabetes chronic complications.

Keywords: Niger Delta, Chronic complications, Type 2 diabetes mellitus

INTRODUCTION

Type 2 diabetes mellitus (T2DM) which represents roughly 90% of all diabetes is a chronic metabolic disease characterized by hyperglycemia due to derangement in carbohydrate, fat and protein metabolism.¹ Globally T2DM has now become an important health concern as a result of its increasing

prevalence as well as it being a growing cause of disability and premature death, mainly through chronic complications.²⁻⁵ More worrisome is the fact that the death rate of people with T2DM is about twice as high as their non-diabetic peers.⁶ Furthermore, permanent disabilities are also a common outcome of diabetic complication such as diabetic eye disease (retinopathy) resulting in blindness and diabetic foot ulcer precedes

more than 85% of non-traumatic lower extremity amputations in diabetic individuals. Since the incidence of diabetes mellitus in the African population is on the increase it is also believed that the outcome of T2DM complications will also increase correspondingly. Meanwhile Nigeria has been reported to have the greatest number of people living with T2DM in Africa with a prevalence that varies from 0.65 in rural Mangu village (Plateau) to 11% in urban Lagos.^{7,8} However, the Nigerian diabetic population lacks the modern therapies that are routinely employed in the care of diabetics when compared with the developed world with the few ones available very expensive.⁹ Therefore, majority of the Nigerian diabetic population can neither assess nor afford meaningful treatment thus the end result is chronic complications which are the major outcome of type 2 diabetes mellitus progress.¹⁰ Yet, few studies have addressed the extent of the T2DM epidemic, as well as the disease burden of diabetic complications to Nigeria's health care system.^{7,11,12} It is obvious that information on prevalence of T2DM related complications is important for the adjustment of policies and practices in diabetic care management to gain better control of T2DM. The aim of this study was to describe the prevalence of chronic complications among T2DM outpatients attending Central hospital Warri, Nigeria a major specialist and referral center serving the city and the riverine areas of Niger Delta; and to analyze the associations between chronic complications and patients' demographics, T2DM related characteristics. This will further enable us to understand the trend of T2DM complications in Delta state as well as compare the local findings with other international findings with a view of improving the overall standard of care and management of diabetes with complication.

METHODS

Study population, recruitment and data collection

This prospective, cross-sectional study which was approved by Health and ethics committee of Central Hospital Warri, Nigeria was carried out in the outpatient clinic of the endocrinology department of the hospital. The Central hospital is located in the Coastal region along the riverine strip of Delta State, one of the 6 states that comprise the Niger Delta aspect of Nigeria. The patients fulfilling the inclusion criteria detailed below and attending diabetic clinic during the period March - August 2014 were invited to participate in the study. The inclusion criteria were; (1) T2DM diagnosed in accordance with international standards, i.e. fasting plasma glucose (FPG) ≥ 7.0 mmol/L and/or 2 hours postprandial plasma glucose (PPG) or casual plasma glucose ≥ 11.1 mmol/L; (2) under regular anti-diabetic drug treatment for at least 1 year; (3) ≥ 40 years old; (4) provided written informed consent to participate in the study.^{13,14} Acutely ill patients requiring hospitalization and patients with renal failure or already on dialysis were however excluded from the study. A sample size of 200 diabetic subject was calculated by using the formula for

calculating sample size for cross sectional studies described by Daniel in 1999 and random sampling technique using the simple lottery method was applied to select the sample size to enable each member of the study population have equal chance of becoming a participant.¹⁵ Detailed information regarding the study procedures was provided to all eligible individuals who were given an opportunity to make informed decision and Only patients who agreed to participate and signed the consent form were included in the study. Trained interviewers were employed to interview the consenting subjects using a questionnaire to capture information on demographics, diabetic related characteristics and complications. A fasting blood sample was drawn after 10-14 hour overnight fasting and the following investigations were done: plasma glucose, HbA1c, lipid profile, serum creatinine. Early morning spot urine samples were also collected for assessment of microalbuminuria using the "MICRAL test" strip, and microalbuminuria was defined as a urinary albumin excretion between 30 and 300 mg/L per day. The Biochemical tests were analyzed on a BM/Hitachi 902 auto analyzer (Boehringer Diagnostics, Mannheim) for all participants; fasting plasma glucose was analyzed by glucose oxidase method, serum creatinine by modified kinetic method of Jaffe, serum urea based on an adaptation of the enzymatic method of Talke and Schubert.¹⁶⁻¹⁸ Total cholesterol was determined using the chod-pap method described by Allain et al while serum triglycerides concentration was determined using the method of Fossati and Prencipe.^{19,20} The dextran sulphate Mg^{2+} method was employed for estimation of HDL-cholesterol while LDL-cholesterol was determined by the polyvinyl sulphate method and HBA1c measured immunochemically on DCA 2000 HbA1c IC auto analyzer using kits supplied by Boehringer Mannheim (Mannheim, Germany).²¹⁻²³ T2DM chronic complications studied were defined by, specific criteria adapting a methodology previously reported by other authors as following.^{24,25}

Nephropathy

Both urine albumin and creatinine measured in this study were used to define nephropathy. Albuminuria was defined as urinary albumin of 30 to 300 mg/g and macroalbuminuria with albumin >300 mg/g) while others with laboratory cut off values of serum creatinine of more than 1.2 for women and more than 1.5 for men were also considered diabetic nephropathy.

Retinopathy

Features of retinopathy which were grouped into proliferative and non-proliferative were extracted from ophthalmologist notes in the patient note.

Neuropathy

Features of neuropathy were extracted from physician's notes.

Dyslipidemia

Dyslipidemia was defined as cholesterol >200 or TG >150 from fasting lipids estimation.

Hypertension

Average blood pressure reading taken at three different times of systolic BP of more than 139 or diastolic BP of more than 89, or those taking antihypertensive medication, were diagnostic features of hypertension. All data generated were analyzed using statistical package for social sciences version 16. (SPSS Inc., Chicago, IL, USA) quantitative data were expressed as mean and standard deviation (SD) while the student's t - test and Chi- square analysis were used to compare the means and the proportions respectively.

RESULTS

Of 200 T2DM patients, 96 (48%) male and 104 (52%) female with mean age for the diabetic population 55.0±8.5 (SD) years and mean duration of DM 7.1±4.7

years as well as sex ratio of male to female was seen as 1:1.1. as seen in Table 1. 130 (65%) had chronic complications with the prevalence of the five complications considered in this study as nephropathy (58%), dyslipidemia (57%), hypertension (48%), neuropathy (14%) and retinopathy (9%) as shown in Table 2 which significantly increased with age as shown in Table 3. The overall prevalence of complications among male subjects was significantly higher than in female subjects ($\chi^2 = 9.70, p = 0.002$) in Table 4. The mean of HbA1c in diabetic patients with chronic complications was 8.53%±1.6% and 70.0% of the subjects with type 2 diabetes related complications had a poor glycemic control with the HbA1c >7.5%.

The average level of HbA1c for the 130 with chronic complications was 8.53% (ranging from 4.2% to 14.0%), whereas it was 7.72% (ranging from 4.6% to 3.5%) for the 70 without chronic complications.

Table 1: Patient’s socio- demographic data (mean±sd).

Variables	Total DM population	T2DM with complications	T2DM without complications	P value
Total number	200	130	70	-
Gender m:f	96:104	69:61	27:43	0.002*
Age (years)	55.0±8.5	56.32±8.61	52.17±7.73	0.001*
Duration of T2DM (years)	8.1±3.2	7.86±5.0	6.38±3.91	0.008*
HBAIC (%)	8.34	8.53	7.72	0.005*

Table 2: Description of chronic complications among type 2 DM in Central hospital Warri.

Chronic complications	Diagnostic criteria	No of patients	%
Nephropathy	Microalbuminuria	116	58%
	Microalbuminuria	76	66%
	By creatinine value	10	8%
Retinopathy	By creatinine value	30	26%
	Proliferative	18	9%
Neuropathy	Non- proliferative	11	61%
	Symptomatic neuropathy	7	39%
Dyslipidemia	Symptomatic neuropathy	28	14%
	Hypercholesterolemia	114	57%
	Hypertriglyceridemia	62	54%
Hypertension	Both combine	24	21%
	Systolic	28	25%
	Diastolic	96	48%
	Both	40	42%
Antihypertensive	Antihypertensive	18	19%
		12	12%
		6	6%

Table 3: Incidence of diabetes chronic complication in relation to age categories.

Age range (years)	With complication	Without complication	p-value
40-50 (n=53)	45.96±2.8 28 (53%)	45.2±2.9 25 (47%)	0.14
51-60 (n=85)	54.63± 2.46 55 (65%)	55.8±2.44 30 (35%)	0.02*
61-70 (n=44)	63.3±1.97 38 (86%)	64.5±3.51 6(14%)	0.23
71- Above (n=18)	73.2±0.67 15(84%)	73.8±2.0 3(16%)	0.33

Table 4: Incidence of diabetes chronic complication in relation to their gender.

Gender	Type 2 DM	With complication	Without complication
Male	96	69 (71%)	27 (28%)
Female	104	61 (59%)	43 (41%)
Total	200	130 (100%)	70 (100%)

Table 5: Status of glycemic control in subjects with chronic complications of T2DM.

glycemic control	With complications n = 130	Without complications n =70
<7.0%	47 (36%)	44 (63%)
>7.0%	83 (64%)	26 (27%)
Total	130(100%)	70(100%)

DISCUSSION

We found that chronic complications are highly prevalent among Warri T2DM outpatients with a 65% prevalence of chronic complication recorded.

This finding is however similar to findings from other populations in Africa who reported that more than half of their study population presented with one form of complication.^{26,27} Moreover, Chineye et al one of the few Nigeria studies that attempted to look at the prevalence also stated that chronic complications were common among diabetes in Nigeria although no clear cut prevalence was stated in the study.⁷ His report however covered some selected states (Lagos- LUTH, LASUTH Ibadan-UCH Kano-AKTH Enugu-UNTH Rivers (UPTH)). Our finding nevertheless differ from reports from other developed countries with lower prevalence rates (33-52%).²⁸⁻³⁰ Additionally the prevalence pattern of the five categories of chronic complications considered were nephropathy (58%), dyslipidemia (57%), hypertension (48%), neuropathy (14%) and retinopathy (9%) respectively. This contrasted a report from an Iranian study where nephropathy was reported in 10%, neuropathy in 52%, retinopathy in 6%, hypertension in 58.5% and hyperlipidemia in 73.5% of the patients.³¹ This could be as a result of the fact that Iranian diet is chiefly fatty and perhaps because they are more stoic as such will report less of neuropathy.³¹ Other studies that have assessed the prevalence of these chronic complications found neuropathy in 24%, nephropathy in 13%, retinopathy 8% and hypertension in 22% of diabetic patients.^{30,32} It is of note that macrovascular indices (hypertension and dyslipidemia) are more in other studies when compared with findings from our study. This may be adduced to the differences in standard of living, sedentary lifestyle and nutrition as this varies from one country to another. We also observed that nephropathy is higher in our setting than other studies. Some authors explained that the genetic makeup of African- makes them more susceptible to impair kidney function hence our study population which is majorly black indigenous people of Nigeria are more likely to have higher diabetic nephropathy.^{33,34}

We also demonstrated in the study that more men had chronic complications than women which may be because men are less likely to seek early medical advice compared to women being financial/bread winner in a resource poor nation, they tend to put their health needs

behind other pressing financial demands. Additionally women are likely to get more financial support for their medical bills from friends and loved ones than men. This finding was consistent with other authors who reported that women with type 2 diabetes mellitus presented a lower probability than men of suffering from chronic complications.³⁷⁻³⁹

Furthermore we found out that majority (69%) of the diabetic population studied were within the 40-60 years age group which represent an active able bodied workforce a factor that can economically impact on the family and society. The incidence of chronic complications among them however increases with age with more complications noted among those greater than 61 years. This was consistent with the Morgan study who also reported that higher incidence of complications and health care expenditure were observed in the aged (>60 years).³⁰

Our study revealed that better glycemic control could lead to fewer incidences of chronic diabetes complications. The UK prospective diabetes study (UKPDS) reported that reduction in A1C level is likely to reduce the risk of diabetes chronic complications, with the lowest risk being in people with A1C levels in the normal range.⁴⁰ Although through a cross-sectional study, we could not conclude that poor glycemic control results in chronic complications, it still triggers a warning to the health authority that there is an urgent need for glycemic management, and the chronic complications of T2DM will worsen under current glycemic status. The overall differences observed in our study when compared with others would have been as a result of the fact that ours was a small-scale study dealing with the prevalence of chronic complications among diabetic outpatients in a single hospital setting as compared to others which were of larger sample sizes ranging from 2000-4, 225 T2DM using both in- and outpatients.³⁵⁻³⁷ Most of the data concerning complications in such studies were established by designated endocrinologists diagnosis unlike ours that relied on a combination of data generated from laboratory investigation, extract from physicians notes and self-reported symptom thus subject to over estimation.

The study draws its strength from the fact that Central hospital Warri, Nigeria is a healthcare system with universal coverage which makes it possible for our study to include almost all the population with type 2 diabetes in the geographical area under study thus avoiding selection bias. However the study was limited by the fact that only patient that sought healthcare were sampled hence, the prevalence of complications can only reflect known cases thus the findings are valid for patients managed by hospitals rather than the general diabetic population.

CONCLUSION

Chronic complications are common phenomenon among type 2 DM as demonstrated amongst the study population, with higher incidence observed in the males than female as well as those in the age of active work group (40-60 years). Consequently there is the need for a better perception of the disease burden among type 2 DM which may help in the identification of more optimal treatment strategies, prevention at the individual level and prioritization of public health resources at the state level. Therefore the need for effective programs for aggressive screening, preventing and treating diabetic complications is strongly recommended.

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