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Prevalence of Diabetes and Pre-Diabetes in Oke-Ogun Region of Oyo State, Nigeria

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Abstract

Background: Oke-Ogun consists of 10 Local Government of Oyo State, Nigeria. Although literature abounds on prevalence of diabetes in Nigeria, there is none in this geo-political zone. There appears to be a high genetic predisposition as well as socio-cultural factors responsible for the prevalence of diabetes and pre-diabetes in this zone.

Objectives: The purpose of the study was to assess the prevalence of diabetes and pre-diabetes and associated socio-demographic characteristics among indigenes of Oke-Ogun.

Method: Of the 10,000 respondents who participated in the study, 6,915 had completed data. Fasting Plasma Glucose (FPG) was measured using calibrated glucometers and classified thus; normal (≤ 6 mmol/l), pre-diabetes (6.1-6.9 mmol/l), and diabetes (≥ 7 mmol/l). Data were analyzed using descriptive statistics, chi-square and binary logistic regression tests at value of $p<0.05$.

Results: There was a female preponderance for diabetes and pre-diabetes. Majority, 63.4% had no formal education, 82.9% earned less than NGN 18,000 ($50) per monthly income. The mean FPG was 5.50 ± 2.20 mmol/l. The overall prevalence of diabetes and pre-diabetes in the study were 4.6% and 6.0% respectively.

Conclusion: This study shows high prevalence of diabetes and pre-diabetes among residents of Oke-Ogun. DM is more common in the females, and in those below the age of 61 years. The high pre-diabetes prevalence might imply an impending diabetes epidemic among the indigene of Oke-Ogun. Family history of diabetes, a surrogate of genetics is an important association of DM in the study. A large proportion of the residents were in abject poverty, a critical factor to be considered in their management.

Keywords: Prevalence; Diabetes; Pre-Diabetes; Oke-Ogun; Oyo state; Nigeria

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Introduction

Diabetes mellitus is chronic non-communicable disease associated with long term complications to the brain, kidney, and the heart. There is destruction and loss of the β-cells of the pancreas causing insulin deficiency; it may also result from abnormalities arising from resistance to insulin. Symptoms of hyperglycemia include polydipsia, polyphagia polyuria, blurred vision, weight loss, generalized pruritus, neuropathy, retinopathy, etc. Life threatening consequences of uncontrolled diabetes include diabetes-ketoacidosis, lactic acidosis and hyper-osmolar non-ketotic state [1].

Diabetes is preceded by impaired fasting glucose (IFG) resulting in a pre-diabetic state which can exist undetected for many years [2], causing irreversible damage to vital organs. Pre-diabetes is a practical term referring to Impaired Fasting Glucose (IFG), impaired glucose tolerance [3] or a glycosylated hemoglobin (A1c) of 6.0% to 6.4%, each of which places individuals at high risk of developing diabetes and it complications. The World Health Organization criteria for diagnosing pre-diabetes are fasting plasma glucose level of between 6.1 mmol/l to 6.9 mmol/l. A fasting plasma glucose level 7.0 mmol/l or more meets the criteria for the diagnosis of diabetes. Fasting value for venous and capillary plasma glucose are identical [4].

There is an increasing prevalence of diabetes and pre-diabetes worldwide [5]. Over 5 million people suffer from the disease in Africa and the number is expected to skyrocket to 15 million by 2025 [5]. In Nigeria, the prevalence varies from 0.65% in rural Mangu village to 11.0% in urban Lagos [6]. With the incidence of diabetes in Africa, diabetic complications are also expected to rise proportionately [7,8]. This will undoubtedly pose serious health and economic problems. The disease affects many people under the age of 64 years in Africa as compared to the developed world where it affects many people over the age of 64 years [7]. In Nigeria, Akinkugbe et al. [6], found that the National prevalence of diabetes was 2.2%, with a male: female ratio of 1:1.1 and a significant increase in prevalence with age. He reported that below the age of 45 years, crude prevalence in males was 1.6% and 1.9% in females, rising to 5.4% in males and 5.6% in females after the age of 45 years with a threefold increase in each gender [6]. Chris et al. reported that the overall prevalence of diabetes was 10.51%; in South Eastern Nigeria [9]. The prevalence of diabetes in South Western Nigeria ranges from 4.76% in Ile-Ife, Osun State to 11.0% in Lagos [5,6]. Olatunbosun et al. [10] reported a prevalence of 0.8% of diabetes mellitus, and 2.2% of Impaired Glucose Intolerance in Ibadan. This was comparable to Owoaje et al. [11] who reported a prevalence of 2.8% in an adult population in Ibadan. Ohwovoriole et al. [12] reported overall prevalence of 1.7% while Erasmus et al. [13] in Ilorin, reported and an overall prevalence rate of 1.43% with no significant difference between men and women. In Port Harcourt, Nigeria, the prevalence was 6.8%, with the male-female ratio of 1.4:1 [14]. In 2004, a survey in Jos [14] reported a prevalence of 10.3%. Nyewe et al. [15] reported a prevalence of 2.2% in Port Harcourt in 2003. A prevalence of 4.7% was reported by Lucia et al. [16] which was higher than the national prevalence of 2.2% reported in the International Diabetes Federation in 2007 [17]. A review of studies on the prevalence of diabetes in adults in Africa by Unwin et al. [18,19] demonstrated a rising prevalence across the continent. However, the prevalence of diabetes in Tanzania was 0.9% [20]. This notable difference in the number of people with diabetes is an indication of the increase in the trend of diabetes in developing countries [21].

In Nigeria, as a result of abject poverty and lack of adequate access to health care, many cases of diabetes are undiagnosed, following closely the rule of Halves [22] which states that: half of the people living with diabetes have been diagnosed, half of those diagnosed received professional care and of those receiving care, only half achieve their treatment goals. Of those achieving treatment targets, half are free from diabetes complications.

Oke-Ogun geo-political zone of Oyo State has a dietary and socio-cultural identity. They are known to consume a lot of carbohydrate/cassava diet and this along with their genetic predisposition; makes them prone to having diabetes mellitus. There is no record of prevalence of DM and pre-diabetes in the area, even though, the disease is common among the people. This study was designed to access the prevalence of diabetes and pre-diabetes and associated risk factors among the residents of Oke-Ogun geopolitical zone of Oyo State, Nigeria and this may just be the first attempt at an intervention to halt this rising trend of a non-communicable disease.

Methodology

Oke-Ogun consists of 10 Local Governments (LG) out of the present 33 in Oyo state. It has a population of about 1.8 million, according to the 1996 census conducted in Nigeria. Oyo state has the largest landmass in the South West geo-graphical zone of Nigeria; sixty percent (60%) of the landmass is the Oke-Ogun area of about 13,537 sq km which is larger than the landmass of 29 out of the 36 states in the present Federation of Nigeria. There is disparity in socio-economic development as reflected by the lack of adequate health facilities, economic investment and educational facilities. The consequence of all these is the pervading low quality of life of people in the area.

This study took place from March 4 to May 6, 2016 on every Friday and Saturday; beginning from 8 am to 10 am at a designated Health Centre in the respective LG. The FPG was done on site after the participants fasted. Permission to screen was sought from the 10 LG chairmen. The purpose of the screening and details of the tests were explained to the respondents and informed consent was obtained.

Sample size of 10,000 was used using the Lesley Kish [23] statistical formula. There are three strata involving local government, wards and participants. There are 10 Local Governments in Oke-Ogun and the respective wards are Atisbo (10 wards), Iseyin (11 wards), Irepo (10 wards), Iwajowa (10 wards), Itesiwaju (10 wards), Kajola (11 wards) Olorunsogo (10 wards), Orelope (10 wards), Saki East (11 wards) and Saki West (11 wards). The first stage involved using the mechanical balloting system, names of the wards in each LG was printed and placed in a container. It was properly mixed. With eyes close, the first 5 wards were pulled out. A total of 50 wards were selected. The second stage involved selection of 200 respondents in each of the wards. 40 respondents were selected each on Friday and Saturday using simple random technique, until a total of 1,000 in each LG and 10,000 for the overall Oke-Ogun areas was obtained.

A structured questionnaire designed to obtain information regarding age, sex marital status, level of education, family history of diabetes and salary scale was administered to the participants by trained assistants. Easymax blood glucose monitors with Serial Numbers (Q91A010211, Q91A010213, Q91A010220) were used. It is relatively cheap equipment, sensitive and specific for developing countries. Fasting Plasma Glucose was preferred because of its convenience in a clinical setting and low cost. The patients were asked not to take any food from 8 AM until the sample was collected. The WHO criteria for diabetes were used. The FPG of the respondents was classified as normal (≤ 6.0 mmol/l), pre-diabetes (6.1-6.9 mmol/l), diabetes (≥ 7.0 mmol/l) [24].

The data was analyzed using the Statistical Packages for Social Sciences (SPSS) version 20 statistical software (SPSS Inc. Chicago, Illinois, USA). Continuous variables, means and standard deviations were calculated and the means compared using the independent samples t test. Pearson Chi-Square test was used to determine the relationship between fasting plasma glucose and socio-demographic factors. Values of $p<0.05$ were considered statistically significant.

Results

The demographic characteristic of respondents is shown in **Table 1**. There was female preponderance. Majority 63.4% had no formal education, 63.2% were married. They were mainly self-employed 59.0%. Majority (82.9%) of the participants earned less than NGN18,000 ($50) per month.

The relationship between the socio-demographic characteristic and fasting plasma glucose is shown in **Table 2**. The mean fasting plasma glucose was higher 5.76 ± 2.33 in those above 61 years, among the females, 5.63±2.88 and males 5.47 ± 2.80 and among those with secondary 6.00 ± 2.28 and tertiary 6.01±3.80 education respectively. FPG was also noticed to be higher among the married (6.13 ± 2.57), self-employed (6.24 ± 2.13) and those with low income (6.06 ± 2.93). This was statistically significant.

The association between socio-demographic factors and fasting plasma glucose is shown in **Table 3**. There was a female preponderance of diabetes 295 (93.7%) and pre-diabetes 356 (85.0%) respectively. Respondents with diabetes 188 (59.7%) and pre-diabetes 357 (85.2) were common among those between age 36-60 years, among those with tertiary education 162 (51.4%), 149 (34.6%), the married 182 (57.8%) and 207 (49.4%).

The association between glycemic level and family history of diabetes is shown in **Table 4**, eighty-one (22.6%) of the respondents with diabetes had a family history of diabetes. This is statistically significant.

Table 1 Socio-Demographic Characteristics of the Respondents (N=6915).

Variables	Frequency	%
Age Groups		
18-35 years	2,415	34.9
36-60 years	4,212	60.9
61 years and above	288	4.2
Mean ± SD	**55.19 ± 15.70**	
Sex		
Male	3,417	49.4
Female	3,498	50.6
Educational level		
No formal education	4,383	63.4
Primary	1,518	22
Secondary	721	10.4
Tertiary	293	4.2
Religion		
Christian	2,190	31.7
Muslim	4,712	68.1
Traditional	13	0.2
Marital Status		
Married	5,750	83.2
Single	566	8.2
Widows/widowers	599	8.7
Occupation		
Unemployed	501	7.2
Civil Servant	904	13.1
Self-employed/Trader	4077	59
Students	1084	15.6
Farmer	349	5.1
Income NGN ($)		
<18,000 ($50)	5,735	82.9
18,000–45,000 ($50-$130)	968	14
>45,000 (>$130)	212	3.1

Discussion

This study aimed to assess the prevalence of diabetes and pre-diabetes and associated risk factors among indigenes of Oke-Ogun geo-political zone of Oyo State.

The prevalence of diabetes in this study was 4.6% (93.7% female, 6.3% male) and pre-diabetes 6.0% (85.0% female and 15.0% male). This is comparable to 4.7% reported by Lucia [15], Sonny and Ekene [25].

The prevalence was higher than 0.6% reported by Chinenye et al. in Port-Harcourt [26], 0.8% by Olatunbosun in Ibadan [10], 1.43% by Erasmus et al. in Ilorin, 1.5% by Ohwovoriole et al. in Lagos [12], 2.2% in Port-Harcourt by Nyewen et al. [15] and 2.8% by Owoaje in Ibadan [11]. The prevalence was also higher than 2.2% reported by the Nigerian National Diabetes. In Tanzania, the prevalence reported by McLarty was 0.9% [20]. Osuntokun et al. [27] reported a prevalence of 0.4% in a hospital based study. The fact that, this study was not a hospital based study may explain the difference in the prevalence compared with various other studies. Though Akinkugbe et al. study [28] was a community based study, their diagnosis also included presence of glycosuria. Similarly, Johnson [29] used urinalysis as the method of detection and diagnosis of diabetes mellitus. In the Erasmus study [13] in Ilorin, there was selection bias and the diagnosis of diabetes was based on the WHO 1980 criteria. Owovoriole in Lagos measured random blood sugar levels in respondents who received an invitation for the screening [12].

The prevalence of diabetes in this study was lower than 6.5% reported by Enang et al. [30], 7.2% reported by the National Non-Communicable Disease Survey [6], 10.51% reported by Chris in South Eastern Nigeria [9], 11.0% in urban Lagos [5,6] and 10.3% in Jos [5].

The study was at variant with Teuscher et al. [31] who noticed an extremely low prevalence of diabetes in a West African rural population using random blood sugar measurement, the prevalence of diabetes in Oke-Ogun- a rural population is high.

In this study, the prevalence of pre-diabetes was 6%. This was higher than the 2.2% obtained by Samuel et al. [20]; a pointer to an impending diabetes epidemic, if no appropriate intervention programme is instituted.

Age and sex were identified risk factors for diabetes mellitus

Table 2 Socio-Demographic Characteristics and Glycemic Level of Respondents.

Variables	FPG (Mean ± SD)	F	P value
Age Groups			
18–35 years	5.43 ± 2.36	3.31	0.04
36–60 years	5.60 ± 3.11		
61 years and above	5.76 ± 2.33		
Sex			
Male	5.47 ± 2.80	5.48	0.02
Female	5.63 ± 2.88		
Educational Level			
No formal education	5.45 ± 2.65	10.57	< 0.01
Primary	5.53 ± 3.33		
Secondary	6.00 ± 2.28		
Tertiary	6.01 ± 3.80		
Marital Status			
Married	6.13 ± 2.57	16.39	< 0.01
Single	5.75 ± 3.08		
Widows	5.47 ± 2.84		
Occupation			
Unemployed	5.60 ± 2.84	5.28	< 0.01
Civil Servant	5.52 ± 2.24		
Trade	5.46 ± 2.83		
Self-employed	6.24 ± 2.13		
Students	5.69 ± 4.31		
Farmer	5.41 ± 2.69		
Retired	5.98 ± 2.54		
Income NGN ($)			
<18,000 ($50)	6.06 ± 2.93	18.21	< 0.01
18,000-45,000 ($50-$130)	5.46 ± 2.85		
>45,000 (>$130)	5.47 ± 1.89		
Total	5.55 ± 2.84		

in this study. There was a female preponderance. The male to female ratio of 1:1.1 is similar to that of Chris et al. [6,24,32]. It also reflects the pattern observed in the study by Okoro et al. [33,34]. Chukwunonso et al. [35] also reported a higher prevalence in females than males. This finding was also similar to that of Oyegbade et al. [36] who reported female to male ratio of 1.7:1. The Nigerian National Non-Communicable Disease survey and other studies [37,38] made similar observations. The combined effect of elderly women than men in most populations, is the most likely reason for this observation. This however is in contrasts with the report of Amoah et al. [39], who observed a slightly higher preponderance among males than females. The worldwide diabetes prevalence is similar in men and women, but it is slightly higher in men greater than 60 years of age and women of older ages [40]. Generally, prevalence and complication of diabetes are more pronounced in females than males as a result of gender associated adiposity [41].

Our findings of diabetes in those below 60 years are consistent with those of Chinenye [26,30]. In developed countries, diabetes is usually seen in those older than 60 years. In Europe for example, the prevalence of diabetes was less than 10% in people younger than 60 and it was 10 to 20% in people aged 60 to 80 years [42]. According to Guariguata et al. [43] people with diabetes in developed countries are predominantly over the age of 50 (74%) while those in developing countries are mostly under the age of 50 (59%). Johnson et al. [20,29] found that the peak incidence of diabetes in Nigeria and Tanzania was 45-59 years of age. The prevalence of diabetes increases with age. In Nigeria for example, the risk of developing diabetes increases 3-4 folds after the age of 44 years. This is attributable to state of healthcare.

A large proportion of the people in this study were from the socio-economic class. This implies a lack of adequate resources to most of the respondents and therefore an important factor to be considered in their management.

Eighty-one (22.6%) of the diabetics had a family history of diabetes. This was similar to the 36.4% who had a family history of diabetes as reported by Uloma et al. [44] while accessing the risk of developing diabetes mellitus among local government employees in Onitsha, South-eastern Nigeria.

Conclusion

The study recorded a relatively high prevalence of DM and pre-diabetes. They are of low socio-economic growth. There is need to enlighten the people about diabetes and it attendant complications.

Limitations and Strength

Blood samples were collected by pricking the finger using one touch glucometer. Venous blood glucose would have been better. However, it has been documented that fasting value for venous and capillary plasma glucose are identical. A more precise measurement would have been glycosylated hemoglobin (A1c), but this is more expensive especially for a large population.

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Public Interest

Diabetes is the presence of excess sugar in the blood either due to insulin hormone deficiency or destruction of the receptors. A fasting plasma glucose level >126 mg/dl (7.0 mmol/l) or a casual plasma glucose >200 mg/dl (11.1 mmol/l) meets the threshold for the diagnosis of diabetes. Symptoms of diabetes include; passage of excessive urine (polyuria), excessive thirst (polydipsia),

Table 3 Association between Socio-Demographic Factors and Glycemic Level.

Variables	Glycemic Level				Chi Square	p-value
	Normal (n=6181)	Pre-diabetes (n=419)	Diabetes (n=315)	Total (N=6915)		
Age Group						
18-35 years	2,415 (39.1)	0 (0)	0 (0)	2,415 (100)	1.53	<0.01
36-60 years	3,667 (59.3)	357 (85.2)	188 (59.7)	4,212 (100)		
>60 years	99 (1.6)	62 (14.8)	127 (40.3)	288 (100)		
Sex						
Male	3,334 (53.9)	63 (15.0)	20 (6.3)	3,417 (100)	4.83	<0.01
Female	2,847 (46.1)	356 (85.0)	295 (93.7)	3,498 (100)		
Education						
No formal Education	4,270 (69.1)	74 (17.7)	20 (6.3)	4,383 (100)	3.2	<0.01
Primary	1,253 (20.3)	103 (24.6)	19 (6.0)	1,518 (100)		
Secondary	553 (8.9)	93 (22.2)	114 (36.2)	721 (100)		
Tertiary	105 (1.7)	149 (35.6)	162 (51.4)	293 (100)		
Marital Status						
Married	5,361 (86.7)	207 (49.4)	182 (57.8)	5,750 (100)	1.25	<0.01
Single	538 (8.7)	28 (6.7)	0 (0)	566 (100)		
Widows	282 (4.6)	184 (43.9)	133 (42.2)	599 (100)		
Occupation						
Unemployed	1,049 (17.0)	31 (7.4)	4 (1.3)	1,084 (100)	3.69	<0.01
Civil Servant	875 (14.2)	22 (5.3)	7 (2.2)	904 (100)		
Self Employed	3,602 (58.3)	260 (62.1)	215 (68.3)	4,077 (100)		
Students	393 (6.4)	35 (8.4)	73 (23.3)	501 (100)		
Farmer	262 (4.2)	71 (16.9)	16 (5.1)	349 (100)		
Income (₦)						
<18,000	5,326 (86.2)	212 (50.6)	197 (62.5)	5,735 (100)	6.08	<0.01
18,000-45,000	735 (11.9)	171 (40.8)	62 (19.7)	968 (100)		
>45,000	120 (1.9)	36 (8.6)	56 (17.8)	212 (100)		

Table 4 Association between Glycemic Level and Family History of Diabetes.

FPG	Family History of Diabetes		Chi Square	p-value
	NO	YES		
<=6 (Normal)	5980 (91.2)	201 (56.1)	460.7	<0.01
6.1-6.9 (Pre-diabetes)	343 (5.2)	76 (21.2)		
≥ 7 (Diabetes)	234 (3.6)	81 (22.6)		
Total	6557 (100)	358 (100)		

excessive food intake (polyphagia) yet associated weight lost. It may cause excessive itching of the entire body (pruritus) as well as the vagina (pruritus vulva). It may cause skin diseases (diabetes dermatopathy). It may also be responsible for sexual dysfunction (infertility). Gestational diabetes mellitus may be responsible for recurrent spontaneous abortion and Intra-Uterine Fetal Death (IUFD). It damages the eyes (blindness), kidneys (kidney failure), heart and blood vessels (atherosclerotic, hypertension). It impairs growth and susceptibility to certain infections. It may also cause stroke. It is associated with high mobility and mortality. The high cost of treatment is a major concerned to both physicians and patients. There is evidence to suggest that early diagnoses may limit associated complications. This research Titled: Prevalence of Diabetes and Pre-Diabetes in Oke-Ogun Region of Oyo State, Nigeria shows the prevalence of diabetes in this geo-political zone which was hitherto unrecorded and the effect of the poor socio-economic status of the people.

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