

Pattern of Dysglycaemia and Family Risk Factors for Diabetes Mellitus among Patients Attending General Outpatient Clinic of Federal Teaching Hospital Ido-Ekiti, Ekiti State, Nigeria

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ABSTRACT

Diabetes mellitus is a non-communicable disease that currently affects over 366 million people worldwide and its prevalence is likely to double by 2030. Therefore, the need to screen for diabetes mellitus has become an impetus. The objective of the study was to determine the prevalence of dysglycaemia and significance of familiar risk factors for diabetes mellitus among the study population.

One hundred and thirty-two and 48 consecutive non-previously diagnosed DM and previously diagnosed DM patients respectively were recruited from the same clinic. An interviewer administered questionnaire was applied and blood samples were taken for blood glucose. The prevalence of dysglycaemia was 36.2% and only 40.6% of the diabetic patients who did fasting blood glucose had glycaemic control. Family history of Diabetes mellitus in the first generation was significantly associated with chance of developing diabetic mellitus in the study population.

In conclusion, it is important physicians begin to be very proactive in the screening for blood glucose in order to detect them early and forestall complications that are associated with late diagnosis of diabetes mellitus.

Keywords: Diabetes Mellitus, Dysglycaemia, Family history, Screening.

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I. INTRODUCTION

Diabetes mellitus (DM) is a metabolic disorder that is characterized by glucose level over a prolonged period [1]. There are three main types of DM: Type 1 (arise from failure of pancreas to produce insulin), Type 2 (insulin

resistance by body cells) and gestational diabetes (occurring for the first time in pregnancy) [2]. In 2017, an estimated of 425 million people had diabetes worldwide [3], with type 2 diabetes making up about 90% of the cases [4]. This represents 8.8% of the adult population [3], with equal rates in both women and men [5]. Studies have suggested that

rates will continue to rise [3]. In Africa, Nigeria is the fourth country with the highest burden of diabetes with an estimated figure of over 1.7 million people living with the disease, but various reports indicate different prevalence rates [1]. Diabetes mellitus doubles a person's risk of early death due to the numerous complications (microvascular and macrovascular) it causes [2]. In 2017 alone, diabetes mellitus resulted in death of approximately 3.2 to 5.0 million people worldwide [3]. Despite the alarming increase in the rate of adult diagnosed with DM, many people are not taking to preventive measures. This prevention involves maintaining a healthy diet, regular physical exercise, a normal body weight, avoiding use of tobacco and regular screening for DM so as to be detected at the pre-diabetic stage during which DM can be curbed or delayed [2].

It is therefore imperative to verify the rate of dysglycaemia (pre-diabetic and diabetic glucose values) and possible risk factors for diabetes mellitus to facilitate appropriate health education and disease prevention measures. This will in turn help to curtail the morbidity and mortality which arise from complications of diabetes mellitus.

II. METHOD OF THE STUDY

The study was carried out to determine the pattern of dysglycaemia and specific risk factors for DM among patients attending the General Outpatient (GOP) Clinic of Federal Teaching Hospital Ido-Ekiti (FETHI). This study emanated from the free blood glucose screening to commemorate the 2019 diabetic week at FETHI. One hundred and thirty-two consecutive and consenting participants that were not known to have diabetes mellitus were recruited in the GOP clinic of the Hospital and 48 consecutive and consenting participants who have been diagnosed and on treatment for diabetes mellitus were also recruited from the same clinic. This is for the purpose of comparison of family risk factors for diabetes mellitus between the diabetic and non-diabetic patients. Adult patients aged 15 to 80 years and patients on only anti-diabetic medications were recruited into the study while critically ill patients were excluded. Some of the participants had fasting blood glucose (FBG) done while some had random blood glucose (RBG) done due to the fact that there was no prior knowledge of having to do the test. All the participants had their blood sugar checked using validated Accu-Chek Active Glucometer, the blood sugar was done between 7.30 am and 9.0 am daily for one week and the results were recorded in the questionnaire. The Accu-Chek Active system uses a capillary blood sample which is set to plasma serum standard, showing result in plasma glucose values. Written consent was obtained from the participants and ethical clearance was obtained from the Hospital Research and Ethics Committee.

III. DATA ANALYSIS

Data collected were analyzed using Statistical Package for Social Science version 21.0. The data were presented in tabular forms and charts as appropriate. Statistics such as

mean, mode, median and standard deviation were determined. Association between dependent and independent variables were compared using Pearson's chi square and Fischer exact test as appropriate. The level of statistical significance was taken as P-value of equal or less than 0.05.

IV. RESULT

The mean age of the respondents was 48.39 ± 15.78 years, the modal age group was 30-39 years and male to female ratio of the respondents was 1:2.2. Majority of the patients had tertiary education (45.6%); class 3 occupational status was the commonest (31.1%) while Yoruba was the preponderant ethnic group (84.4%).

TABLE 1: SOCIODEMOGRAPHIC FACTORS OF THE RESPONDENTS

Sociodemographic factors	No (180)	%
Age group		
10-19	05	2.8
20-29	11	6.1
30-39	45	25.0
40-49	39	21.7
50-59	37	20.5
60-69	21	11.7
70-79	15	8.3
80-89	07	3.9
Gender		
Male	56	31.1
Female	124	68.9
Education		
Primary	13	7.2
Secondary	70	38.9
Tertiary	82	45.6
None	15	8.3
Occupation		
Grade 1	2	1.1
Grade 2	50	27.8
Grade 3	56	31.0
Grade 4	30	16.7
Grade 5	12	6.7
Grade 6	30	16.7
Ethnicity		
Yoruba	152	84.4
Hausa	09	5.1
Ibo	08	4.4
Others	11	6.1

Occupation: grade 1- professional/ contractors/ Business tycoon.

Grade 2 – senior civil servants/ secondary school teacher.

Grade 3 - intermediate civil servants/ primary school teachers/ Artisans.

Grade 4- messengers, small scale traders.

Grade 5 – unemployed.

Grade 6 – retirees.

Table 2 shows that 27.5% of the participants who did fasting blood glucose had dysglycaemia, while 8.7% of those who did random blood glucose had dysglycaemia. Overall, 36.2% had dysglycaemia.

Among the known diabetic patients on antidiabetic medication, 40.6% had glycaemic control with fasting blood glucose, and 75% with random blood sugar had glycaemic control based on a single test done using glucometer.

Table 3 below shows that increasing age is significantly associated with development of diabetes mellitus, and statistically significant number of patients with diabetes mellitus had history of DM in the first generation. There is no statistically significant association between history of DM in the second degree relative and diabetes mellitus in

the participants, though there is an increase in rate of development diabetes mellitus with positive history in the second generation.

TABLE 2: BLOOD GLUCOSE PATTERN OF THE RESPONDENTS

Blood sugar pattern (in mmol/L)	Frequency	%
FBG in non-diabetics (40)		
Normal (≤ 5.5)	29	72.5
Pre-diabetic (5.6-6.9)	9	22.5
Diabetic (≥ 7.0)	2	5.0
RBG in non-diabetics (92)		
Normal (< 7.8)	84	91.3
Pre-diabetic (7.8 -11)	7	7.6
Diabetic (≥ 11.1)	1	1.1
FBG in known diabetics (32)		
< 4.4 (hypoglycaemia)	0	0
4.4 – 7.2(control)	13	40.6
> 7.2 (uncontrol)	19	59.4
RBG in known diabetics (16)		
< 10 (control)	12	75.0
≥ 10 (uncontrol)	4	25.0

TABLE 3: THE RELATIONSHIP BETWEEN DIABETIC MELLITUS AND FAMILY HISTORY

Age group	Prior DM status		χ^2	P-value
	Yes 48 (%)	No 132 (%)		
10-19	2(40.0)	3(60.0)	25.87	0.001
20-29	0(0.0)	11(100.0)		
30-39	6(13.3)	39 (86.6)		
40-49	7(17.9)	32(82.1)		
50-59	11(29.7)	26 (70.3)		
60-69	13(61.9)	8(38.1)		
70-79	6(40.0)	9 (60.0)		
80-89	3(42.9)	4(57.1)		
Family History of DM in first degree relative (n=180)				
Yes	18(69.2)	8(30.8)	28.7	0.001
No	30(19.9)	121(80.1)		
I do not know	0 (0.0)	3(100.0)		
Fam. History of Dm in 2nd degree relatives (n=180)				
Yes	5(62.5)	3(37.5)	5.497	0.064
No	40(25.0)	120(75.0)		
I don't know	3(25.0)	9 (75.0)		

Table 4 below showed that there is no statistically significant association between age, gender, education, occupation, ethnicity and dysglycaemia among the respondents. Nevertheless, from age 30 years there is increase in the rate of dysglycaemia to age 69 years (see Fig. 1 below). Dysglycaemia is found among female than male and 50% of people with no education has dysglycaemia as compared with 18.8% and 28.6% of people with secondary and tertiary education respectively. Conversely dysglycaemia is found more among those who did not have history of DM in first degree or secondary relations (11% in both)

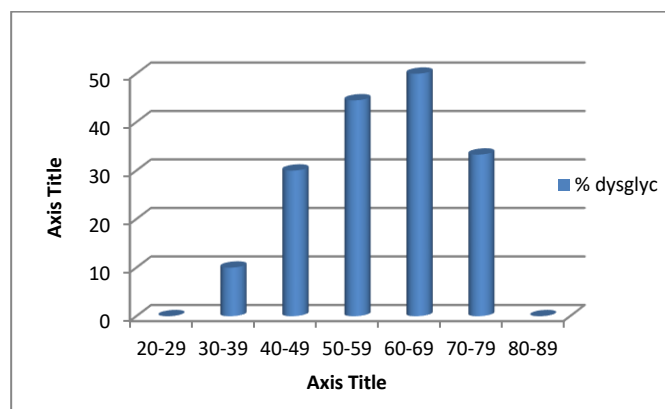


Fig. 1. Pattern of dysglycaemia across age groups (using FBG).

TABLE 4: RELATIONSHIP BETWEEN SOCIODEMOGRAPHIC FACTORS AND DYSGLYCAEMIA USING FBG

	FBG in non-diabetic patients		Chi sq.	p-value
	Normal	dysglycaemia		
Age group				
20-29	2(100)	0(0)	9.202	0.686
30-39	9(90)	1(10)		
40-49	7(70)	3(30)		
50-59	5(55.5)	4(44.5)		
60-69	2(50)	2(50)		
70-79	2(66.7)	1(33.3)		
80-89	2(100)	0(0)		
Sex				
Male	9(100)	0(0)	4.405	0.111
Female	20(64.5)	11(35.5)		
Level of education				
Primary	3(75)	1(25)	12.358	0.054
Secondary	13(81.2)	3(18.8)		
Tertiary	10(71.4)	4(28.6)		
No education	3(50)	3(50)		
Occupation				
Grade 1	0(0)	0(0)	12.598	0.126
Grade2	12(100)	0(0)		
Grade3	10(66.7)	5(33.3)		
Grade4	2(28.6)	5(71.4)		
Grade5	2(100)	0(0)		
Retiree	3(75)	1(25)		
Ethnicity				
Yoruba	26(70.3)	11(29.7)	1.230	0.975
Ibo	1(100)	0(0)		
Hausa	1(100)	0(0)		
Other	1(100)	0(0)		
Fam hist of DM in 1st generation				
Yes	2(100)	0(0)	0.799	0.671
No	27(71.1)	11(28.9)		
I don't know	0	0		
Fam hist of DM 2nd generation				
Yes	0(0)	0(0)	0.389	0.823
No	28(71.8)	11(28.2)		
I don't know	1(100)	0(0)		

There is increase in the rate of dysglycaemia with increasing age until age 70 years when there is a decline. Table 5 below shows that there is a statistically significant association between age and dysglycaemia with participants who had random blood glucose assessment. However no statistically significant relationship between gender, occupation, education, ethnicity and dysglycaemia among participants who had Random Blood Glucose assessment done. Against the expected, dysglycaemia was commoner among participants with no history of DM in the first degree relative but higher among participants with positive family history of DM in the secondary degree relatives.

TABLE 5: RELATIONSHIP BETWEEN SOCIODEMOGRAPHIC FACTORS AND DYSGLYCAEMIA USING RBG

	RBG in non-diabetic patient (92)		Chi sq	P-value
	Normal (%)	dysglycaemia		
Age group (92)				
10-19	3 (100)	0 (0)	54.803	0.001
20-29	9(100)	0(0)		
30-39	28(96.6)	1(3.4)		
40-49	20(90.9)	2(9.1)		
50-59	15(88.2)	2(11.8)		
60-69	4(100)	0(0)		
70-79	5(83.3)	1(16.7)		
80-89	0(0)	2(100)		
Sex (92)				
Male	31(86.1)	5(13.9)	2.684	0.261
Female	53(94.6)	3(5.4)		
Level of education (92)				
Primary	4(100)	0	8.119	0.230
Secondary	29(90.6)	3(9.4)		
Tertiary	47(94.0)	3(6.0)		
No education	4(66.7)	2(33.3)		
Occupation (92)				
Grade 1	2(100)	0(0)	8.075	0.622
Grade2	29 (93.5)	2(6.5)		
Grade3	22(91.7)	2(8.3)		
Grade4	15(93.8)	1(6.2)		
Grade5	7(87.5)	1(12.5)		
Retiree	9(81.8)	2(18.2)		
Ethnicity (92)				
Yoruba	66(90.4)	7(9.6)	2.088	0.911
Ibo	6(100)	0(0)		
Hausa	5(83.3)	1(16.7)		
Other	7(100)	0(0)		
Fam hist of DM in 1st Gen.				
Yes	6(100)	0(0)	0.950	0.917
No	75(90.4)	8(9.6)		
I don't know	3 (100)	0(0)		
Fam hist of Dm in 2nd Gen				
Yes	2(67.7)	1(33.3)	3.624	0.459
No	74(91.4)	7(8.6)		
I don't know	8(100)	0(0)		

V. DISCUSSION

The study aimed at determining the pattern of dysglycaemia among patients attending the general outpatient clinic of Federal Teaching Hospital Ido-Ekiti. One hundred and eighty participants were screened in the clinic using Accu-Chek Active glucometer, 132 were not known diabetics and 48 were previously known diabetic patients. The mean age of the respondents was 48.39 ± 15.78 , the modal age group was 30-39 and male to female ratio of the respondents was 1:2.2. The ratio of female doubles the male in this study; this is in consonant with some other studies [6], [7]. In many studies women were found to visit health facilities more often than men [6], [7]. Several studies reported higher levels of non-attendance among male patients than females [6], [7]. Sharp and Hamilton in their study provided an informal review of the evidence on non-attendance and reported that being male was one of the main associations with hospital non-attendance [6]. Moore *et al* investigated over 4000 appointments at a family practice centre in the USA and found that females tended to be less likely to miss appointments than males [7].

From age 30 years there is an increase in the rate of dysglycaemia to age 69 years (Fig. 1). Dysglycaemia was

found more among female than male and 50% of people with no education had dysglycaemia compared to 18.8% and 28.6% of people with secondary and tertiary education respectively [8]. A meta-analysis found that impaired glucose tolerance was found to be more common among women than among men and aging was also found to be significantly associated with impaired glucose tolerance [4]. In general, women have a smaller mass of muscle than men and therefore less muscle available for the uptake of the fixed glucose load (75 g) used in the oral glucose-tolerance test. Women also have relatively high levels of estrogen and progesterone, both of which can reduce whole-body insulin sensitivity [4], [8].

The prevalence of dysglycaemia in this study was 36.2% which means that about 4 out of 10 participants had dysglycaemia among patients visiting our hospital for other reasons. Sixteen of them (30.1%) were at pre-diabetic stage and 3(6.1%) met the criterion for diagnosis of diabetic mellitus in this study. A systematic review and meta-analysis study showed that prevalence of diabetes mellitus in Nigeria ranges from 2% to 12 % depends on the geopolitical zone, 5.5% was reported in south west and 9.8% in the south-south [4]. This is comparable to 6.1% found in this study. Likewise, a study done in Ethiopia, the prevalence of DM was found to be 6.5% (26 out of 402) [9]. Of which, the proportion of previously undiagnosed diabetes mellitus was 88.5%. The prevalence of pre-diabetes was also found to be 15.9% in the same Ethiopia study, [9] which is almost half of pre-diabetes mellitus in our study. This is a community based cross-sectional study unlike in our study where hospital based cross-sectional study was conducted and this could account for the differences in the findings.

According to the International Diabetes Federation (IDF), 425 million persons are currently living with DM worldwide, with nearly 50% of this undiagnosed [3]. The developing economies of Africa and Asia were said to contribute a significant fraction of this figure. There is also a rising burden from the complications of DM alongside the ever-increasing prevalence of the disease [3]. It is therefore important to be proactive in our consultations as physicians in Nigeria, not only to treat the complaints presented by the patients but also to screen for other health conditions like diabetes mellitus. It was also found in this study that increasing age and family history of diabetes mellitus were significantly associated with development of diabetes mellitus. Participants who were previously diagnosed to be diabetic were found to have family history of diabetes mellitus especially in the first degree relatives. Similarly, a meta-analysis reported that risk factors for the pooled prevalence of DM were a family history of DM and older age among others like urban dwelling, unhealthy dietary habits; cigarette smoking, physical inactivity, and obesity [4], [8]. However, in our study, gender, occupation, educational attainment, and ethnicity were not significantly associated with dysglycaemia as found in other studies [9], [10].

Among the diabetic patients who had their fasting blood sugar done, only 40.6% had good blood sugar control while in those who had random blood sugar done 75% had good control as at the time of the screening. The percentage of

patients with controlled fasting blood sugar in this study is unacceptably low though this is higher than the prevalence of controlled blood sugar (13.6%) reported in a study done in Ghana by Flagbe J et al. [11]. A multicenter study across seven tertiary health centers in Nigeria also reported that 32.4% and 20.4% patients achieved the ADA and IDF glycaemic targets, respectively (though HbA1C was used in this study) [12]. The reasons for these variations in glycaemic control across countries and zones could be multi-factorial e.g., method of glycaemic analysis, poor adherence to medication, poor patient-doctor relationship, none keeping to medical appointment given etc.

In conclusion, the proportion of dysglycemia in this study is unacceptably high, hence Physicians should be more proactive to screen patients for blood sugar so as to detect many at pre-diabetes stage. The proportion that will develop diabetic mellitus could be reduced through appropriate health education on lifestyle modification.

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