Original Research

Type 2 diabetes mellitus risk assessment among doctors in Ondo state

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Abstract

Introduction

Diabetes Mellitus (DM) has become a disease of public health importance in Nigeria. Early identification of DM risk is important in the reduction of this disease burden. This study assessed ten-year risk of developing type 2 DM among some medical doctors in Ondo State.

Methods

This was a cross-sectional study that assessed ten-year risk of developing type 2 DM among some doctors using the Finland Diabetic Risk Score form. Known diabetics were excluded from the study. Body mass index (BMI), waist circumference (WC), blood pressure and total DM risk score were determined for each participant.

Results

One hundred and ninety-two doctors participated in the study with a male: female ratio of 1.3:1. Majority (92.2%) were below 55 years, 22 (11.5%) were obese, 32(16.7%) had central obesity, 46(24%) reported physical inactivity, 49(25.5%) had family history of DM, 141(73.4%) do not take fruits and vegetables regularly. Forty-three (22.4%) were found to have elevated blood pressure while 6(3.1%) had elevated blood glucose. Fifty-seven (29.7%) of the participants had increased ten-year DM risk. Significant predictors of increase DM risk were age ≥ 45 years (AOR:9.08; CI 3.13-26.33; p = <0.001) ; BMI ≥25kg/m^2 (AOR:11.41; CI:4.14-31.45; p = <0.001) ; family history of DM (AOR:9.93; CI:3.25-30.39; p = <0.001) ; abdominal obesity (AOR:6.66; CI:2.08-21.29; p= < 0.001); and infrequent dietary intake of fruits and vegetable(AOR:3.11;CI:1.03:9.37: p = 0.04)

Conclusion

There was increased 10-year DM risk in about 30% of the participants. Lifestyle modification such as physical activity and regular consumption of fruits and vegetables should be encouraged among doctors.

Keywords: type 2 diabetes mellitus, risk, doctor, nigeria

Introduction

Diabetes mellitus (DM) is a disease of public health importance worldwide. The prevalence has continued to increase in developing countries including Nigeria[1]. Globally, 382 million people which constitute 8.3% of adult population had DM by the end of 2013 according to International Diabetes Federation (IDF)[2]. About 80% of this population lived in the low and middle income countries. It is also projected that this number will reach 592 million by year 2035 if preventive measures are not put in place[2].

About twenty million people in sub-Saharan Africa have diabetes and only one-third is diagnosed[2]. The IDF projected that DM may affect about 41.4 million people by 2035[2]. In Nigeria, there has been an increase in the prevalence of DM affecting of all geographical zones. In a systematic review and Met-analysis done by Uloko et al[1] in 2017, the pooled prevalence of DM in Nigeria was found to be 5.77%.

DM is associated with high morbidity, mortality and huge economic burden even in the developed countries. Chineye et al[3] studied 531 diabetic patients in seven Nigerian tertiary hospitals and found high prevalence of different complications; peripheral neuropathy (59.2%), retinopathy (35.5%), cataracts (25.2%), cerebrovascular disease (4.7%), diabetic foot ulcers (16.0%), and nephropathy (3.2%). Hyperglycemic emergencies which are amongst the common indications for DM related hospitalization is associated with high case fatality in Nigeria[4,5]. Approximately one-half of patients with type 2 diabetes die prematurely of a cardiovascular cause while 10% die of renal failure [6]. There is projection that the absolute global economic burden of DM will increase from 1.3 trillion USD to about 2.1 trillion USD by 2030[7]. There is also reduction in overall quality of life of DM patients[8, 9]. Prevention and early diagnosis of DM are important and effective strategies in reducing the global burden of the disease.

Medical doctors play key role in ensuring optimal health of the citizens of a nation which is important for economic growth. Despite their medical knowledge, medical doctors have a tendency to present late when they have any medical illness because majority of them have poor health seeking attitude[10]. This study assessed medical doctors for type 2 diabetic risk during the continuing medical education (CME) program organized by the Nigerian Medical Association. Those with increased risk of diabetes mellitus

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were identified, offered health education and counseling on lifestyle modification aimed at reducing this risk.

Materials and Methods

Study Design

This was a cross-sectional study carried out during a continuing medical education program organized by Nigerian Medical Association in 2019. The study was conducted among medical doctors working in Ondo State, South-western Nigeria.

Study Sample Size

The minimum sample size for this study was calculated using the prevalence of DM among doctors from a previous study as 11.1%, a value of 95% confidence level and an error margin of 5%[11]. A minimum sample size of 152 was obtained, however 192 medical doctors participated in the study

Study Participant

Consenting medical doctors who attended the continuing medical education organized by the Nigerian Medical Association were consecutively recruited in the study. Those who were previously diagnosed diabetic were excluded. The study participants were assessed for 10 year risk of developing type 2 DM using an interviewer administered Finland Diabetic Risk Score (FINDRISC score) form. This form has been recommended by the International Diabetes Federation as a cheap and valid screening tool for type 2DM in resource limited settings[12]. This diabetic risk assessment form has been previously validated among Africans; showing 77% sensitivity, 89% specificity and that the area under the ROC curve was 0.86[13].

The questionnaire contained eight simple questions that assessed risk factors for T2DM. These risk factors were age (years), body mass index (kg/m^2), waist circumference (cm), daily consumption of fruits or vegetables, daily physical activity (having at least 30 minutes of physical activity during work or at leisure time), history of antihypertensive drug treatment, history of high blood glucose, and family history of diabetes mellitus in the first-degree or second-degree relatives. Each of these was assigned with weighted scores according to its associated risk, and the final scores range from 0 to 26 points. The total score was used to categorize the 10 year risk of each participant of developing DM as follows; <7 points as low risk, 7-11 points as slightly elevated risk, 12-14 points as moderate risk; 15-20 points as high risk and > 20 points as very high risk.

Blood pressure was measured on the right arm using the mercury sphygmomanometer (Accoson, Harlow, United Kingdom) with a standard cuff size and the participants in sitting position after about 5 min of rest. Elevated blood pressure was defined as blood pressure value of ≥140/90mmHg on measurement. Waist circumference (WC) was measured at a point midway between the lowest rib and the iliac crest. Abdominal obesity was defined as WC >102cm in males and 88 cm in females. The height and weight of participants were measured using a stadiometer (RGZ 160 Lincon Mark Medical, England). Body mass index (BMI) was calculated from the weight and height and expressed as kg/m^2. BMI of between 25-29.9kg/m^2 was categorized as overweight and ≥30 kg/m^2 was categorized as obese. Determination of random blood glucose was done for each participant using ACC Check glucose meter. Elevated random blood glucose was defined as blood glucose greater than 200mg/dl.

Ethical approval was obtained from the Research and Ethical Committee of University of Medical Sciences, Ondo.withn a protocol number HREC/01/2019/VII/4616

Data Analysis

Data entry and analysis was done using IBM Statistical Package for Social Science version 21. Categorical variables were expressed as frequencies and proportions. Data were displayed in tables and charts. Univariate analysis was used to determine significant factors associated with increased type 2 DM risk. Binary logistic regression analysis was used to determine the significant predictors of increased type 2 DM risk. Pearson's correlation analysis was used to determine association between random blood glucose, BMI, abdominal circumference, age and total diabetic risk score. P value of ≤ 0.05 was considered significant.

Results

One hundred and ninety-two doctors participated in the study comprising of 110 males (57.3%) and 82 females (42.7%). One hundred and twenty-four (64.6%) were below 45 years. (Table 1)

Table 1: Characteristics of Study Participants

Characteristics	n (%)
Age Group	
< 45 years	124 (64.6%)
45-64 years	53(27.6%)
>64 years	15 (7.8%)
Gender	
Male	110(57.3 %)
Female	82 (42.7 %)
Body Mass Index (Kg/m^2)	
< 25	120(62.5 %)
25-29.9	50(26.0 %)
≥30	22(11.5 %)
Abdominal Obesity	
Yes	32(16.7%)
No	160(83.3%)
Physical Activity	
Yes	146(76.0 %)
No	46(24.0%)
Daily Consumption of Vegetables/Fruits	
Yes	51(26.6%)
No	141(73.4)
Family History of Diabetes Mellitus	
Yes	49(25.5%)
No	143(74.5%)
Elevated Blood Pressure	
Yes	43(22.4%)
No	149(77.6%)
Elevated Blood Glucose	
Yes	6(3.1%)
No	184(96.9%)

Table 2: Factors Associated with Increased Risk of Diabetes Mellitus Among Doctors

	Low Diabetic Risk n(%)	Increased Diabetic Risk n(%)	OR	95% CI	P- value
Gender					
Male	83(75.5)	27(24.5)	1.77	0.95-3.13	0.050
Female	52(63.4)	30(36.3)			
Age					
<45 years	101(81.5)	27(18.5)	4.39	2.28-8.47	< 0.001
≥45 years	34(50.0)	34(50.0)			
Body Mass Index					
>25 kg/m^2	103(85.8)	17(14.2)	7.57	3.79-15.14	<0.001
≥25 kg/m^2	32(44.4)	40(55.6)			
Abdominal Obesity					
Yes	127(79.4)	33(20.6)	11.55	4.76-28.03	<0.001
No	8(25.0)	24(75.0)			
Physical Inactivity					
Yes	107(80.4)	39(19.6)	1.76	0.88-3.54	0.08
No	28(60.9)	18(39.1)			
Daily Consumption of Vegetable and Fruit diet					
Yes	41(80.4)	10(19.6)	2.05	0.95-4.45	0.046
No	94(66.7)	47(33.3)			
Family History of DM					
Yes	111(75.0)	37(25.0)	2.50	1.24-5.04	0.009
No	24(54.5)	20(45.5)			
Hypertension					
Yes	27(62.8)	16(37.2)	0.64	0.31-1.31	0.150
No	108(72.5)	41(27.5)			

Fifty (26%) were overweight while 22 (11.5%) were obese. Abdominal obesity was present in 32 (16.7%), physical inactivity was reported in 46(24%), 51(26.6%) consume vegetable/fruits daily. Family history of diabetes mellitus was present in 49 (25.5%), 43 (22.4%) had blood pressure ≥140/90 mmHg while 6(3.1%) had elevated random blood glucose. (Table 2)

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Table 3: Predictors of Increased Risk of Diabetes Mellitus Among Doctors

	Adjusted Odd Ratio	95% CI	P-value
Age	9.08	3.13-26.33	<0.001
Gender	1.82	0.81-4.71	0.214
BMI	11.41	4.14-31.45	<0.001
Physical Inactivity	1.37	0.52-3.64	0.528
Family History of DM	9.93	3.25-30.39	<0.001
Abdominal Obesity	6.66	2.08-21.29	0.001
Daily consumption of vegetable and fruit diet	3.11	1.03-9.37	0.044

Table 4: Correlation between Random Blood Glucose, Age, Waist Circumference, Body Mass Index and Total Diabetes Mellitus Risk Score

Parameter	R	P value
Age	0.127	0.080
Waist Circumference	0.249	<0.001
Body Mass Index	0.162	0.025
Total Diabetes Mellitus Scores	0.139	0.055

This study showed that 29.7% of the medical doctors who were assessed had increased 10 year risk of type 2 diabetes mellitus. Among those with increased risk; 14.1% had moderate to high 10 year risk of developing DM. (Figure 1) Among those that had increased 10 year risk of developing DM, there was a higher proportion of females compared to males (36.3%vs24.5%, p = 0.050). Significant factors associated with increased type 2 DM risks were age ≥45 years (OR: 4.39; CI: 2.28-8.47; p = < 0.001); BMI ≥25 kg/m^2 (OR: 7.57; CI: 3.79-15.14 ; p = < 0.001); abdominal obesity (OR: 11.55; CI: 4.76-28.03; p = < 0.001); daily consumption of vegetable and fruit diet (OR:2.05; CI:0.95-4.45; p = 0.046); family history of DM (OR:2.50; CI: 1.24-5.04; p =0.009). Table 2

Significant predictors of increased DM risk on binary regression analysis were age ≥45 years (AOR:9.08; CI 3.13-26.33; p = <0.001) ; BMI ≥25kg/m^2 (AOR:11.41; CI:4.14-31.45; p = <0.001) ; family history of DM (AOR:9.93; CI:3.25-30.39; p = <0.001; p=) ; abdominal obesity (AOR:6.66; CI:2.08-21.29; p= < 0.001) and infrequent dietary intake of fruits and vegetable(AOR:3.11;CI:1.03:9.37: p = 0.04) Table 3

There was a positive correlation between random blood glucose and age (r = 0.127, p = 0.080); random blood glucose and waist circumference (r = 0.249, p = <0.001); total diabetes mellitus risk score (r = 0.139, p = 0.055); and random blood glucose and body mass index (r = 0.162, p= 0.025). (Table 4).

Discussion

Majority of the respondents were young and there was male preponderance in this study which is similar to some previous studies involving medical doctors[14,15]. However, some other studies which involved doctors and other groups of health workers as participants had female preponderance[16-18].

This study showed that 29.7% of the medical doctors who were assessed had increased 10-year risk of type 2 diabetes mellitus. Among those with increased risk; 14.1% had moderate to high risk 10 year risk of developing DM. A higher proportion (36.3%) of females had increased 10 year risk of developing type 2 DM compared to males (24.5%). This is comparable with findings of Omech et al[13] who reported higher diabetic risk in females.

The prevalence of obesity among the doctors in our study was 11.5% which is comparable with 13.6% reported among Nigerian doctors in Southern part of Nigeria and 12.5% reported among some health workers in Ghana[14,18]. Our finding was however; lower than 23.2% reported among health care providers in a teaching hospital in Plateau State, Nigeria[19]. This difference may be related to the fact that our study involved only doctors while the study done in Plateau State, Nigeria involved both the doctors and other

health workers. The prevalence of obesity in our study is also comparable with reports from studies conducted among Canadian and Estonian doctors where prevalence rates of 8% and 9% were reported respectively[20,21]. Our study showed that the doctors with higher BMI (≥25kg/m2) have eleven fold risk of developing type 2 DM in 10 years.

Abdominal obesity was present in 16.7% of our study participants which is comparable with 13.9% reported among health care workers in a tertiary health centre in Bayelsa, Nigeria[16].

However, our finding is lower than 37.3% reported in a previous study among Nigerian doctors[14]. This difference may be partly due to difference in criteria used to diagnose abdominal obesity. Our study used waist circumference of greater than 88cm and 102 cm in males and females respectively unlike the previous study by Ambakederemo et a1[14] where a stricter criteria of greater than 80 cm and 94 cm were used. Higher prevalence rate of abdominal obesity was reported in a study conducted among health workers in Plateau State, Nigeria[19]. This difference may be related to the fact that our study involved only the doctors while the study done in Plateau State, Nigeria involved both the doctors and other health workers. . Our study showed that the doctors with abdominal obesity have about seven fold risk of developing type 2 DM in 10years

The findings in our study is in keeping with reports of Uloko et al[1] in a systematic review of studies on DM in Nigeria. They reported obesity as an established risk factor for type 2 DM among Nigerians. Both generalized and central obesity are associated with increased amount of non-esterified fatty acids, glycerol, cytokines, pro-inflammatory markers that are involved in the development of insulin resistance and diabetes mellitus[22].

Elevated blood pressure of ≥140/90 mmHg was found in 21% of our respondents. This is comparable to reports of previous studies conducted among doctors[14,23]. Ambakederemo et al[14] and Ordinioha[23] reported prevalence of 22.1 % and 21.3% respectively in different studies among doctors in Southern part of Nigeria. This is also similar to findings of Egbi et al[16] who reported elevated blood pressure in 22.5% of hospital workers in a tertiary hospital in Bayelsa State. Our finding was lower than 16.1% reported among health workers in Ghana during an annual medical screening exercise.[18] There was a higher proportion of doctors with hypertension in our study who had increased type 2 DM risk, but it was not statistically significant. Adequate physical activity was self reported by 76% of the respondents which is higher than 65.8% reported among physicians in Saudi Arabia,[24] but lower than 92% reported among Estonian physicians.[21] However, our finding is at variance with some previous reports from Nigeria. Ambakederemo et al[14] and Aghaji et al[15] reported that 25.4% and 38.1% of their respective study participants who were only doctors had adequate physical activity. Also, Iwuala et al[25] reported adequate physical activity in 20.8% of the health care provider in a study conducted in Lagos, Southwest Nigeria. This contrast may be related to the difference in the methodology used in assessing physical activity. For example, Iwuala et al[25] used International Physical Activity Questionnaire-SF (IPA-SF), which is a standardized and more objective instrument. Also, the population in their study comprised of various types of health workers unlike ours that involved only the medical doctors whose routine clinical work commonly is associated with some form of physical activities. Although, there was a higher proportion of doctors who reported physical inactivity in our study with increased type 2 DM risk, it was not statistically significant. Physical inactivity is associated with insulin resistance, obesity and other cardiovascular risk factors.[26,27] In a multiethnic study by Joseph et al[28], higher physical activity was inversely associated with incident type 2 DM. Physical activity reduces blood glucose by increasing GLUT-4 mediated glucose uptake into muscle; reduction in insulin resistance, body weight, adiposity and inflammation[29,30].

Family history of diabetes mellitus was present in 25.5% of our respondents. This is similar to 27.4% reported in a study done in Southern Nigeria that involved only the medical doctors, but higher than 17.3% reported in a study conducted among hospital workers in Bayelsa[14,16]. Our study showed that there was a tenfold increased risk of developing type 2 DM in those with family history of DM. Family history of DM is a strong independent risk factor for developing DM [31]. It has been reported that first degree relatives of type 2 DM patients have up to 40% higher chance of developing the disease[32]. Therefore, there is need to be more aggressive in addressing other modifiable risk factors for DM in these group of individuals.

About 27% of the doctors in our study consumed vegetables and fruits daily which is comparable with 25.4 % reported by Ambakederemo et al[14] among doctors in Southern Nigeria. However, Frank et al[20] reported better consumption of fruits and vegetables amongst Canadian physicians; more than 50% of females and about 34% of them consumed fruits daily. Inadequate consumption of fruits and vegetables has been established as a risk factor for developing type 2 DM [33]. Our study showed that doctors who infrequently consumed fruits and vegetables have three fold increased risk of developing type 2 DM over ten years. Systematic review of prospective cohort studies by Li et al [34] showed that adequate dietary intake of fruits and vegetables reduces the risk of type 2 DM. Fruits and vegetables contain flavonoids and antioxidants that could reduce the risk of type 2 DM by mitigating oxidative stress that influence uptake of glucose and also increasing insulin sensitivity [35-37].

Elevated random blood glucose was present in 3.1% of our study participants. This is comparable with 2.7% reported among health care workers in Southern Nigeria, but lower than 4.5 % reported among the medical doctors by Ambakederemo et al[14].There was positive correlation between random blood glucose, age, waist circumference and BMI. In our study, age ≥45 years is associated with a nine fold increased risk of developing DM.

Previous studies have corroborated the association between blood glucose, body mass index and age[38.39]. Aging and obesity are associated with insulin resistance that may predispose to increase in blood glucose. Therefore weight reduction is also important in reducing the risk of developing type 2 DM especially amongst those who have other additional risk factors such as family history.

The limitation of this study is that blood pressure and blood glucose were only assessed once. It would have been better assessed on two different occasions to confirm the diagnoses of hypertension and diabetes mellitus. Also, glycated haemoglobin was not assessed in the study participants. However, the strength of this study lies in the fact that it is one of the few studies conducted in Nigeria to the best

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of our knowledge that assessed type 2 diabetic risks among medical doctors.

In conclusion, there was increased 10-year DM risk in about 30% of the participants which was more common among females. There is an urgent need to promote healthy lifestyle practices among doctors. Physicians should make conscious efforts to practice what they know.

Conflict of Interest

None

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