Original Article

Risk Assessment for Type 2 Diabetes Mellitus among Participants in a Market Survey at Ebonyi State, South East Nigeria, Using Finnish Diabetes Risk Score Questionnaire

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Abstract

Background: Type 2 diabetes mellitus is a metabolic disorder arising from insulin resistance and/or decreased insulin secretion and has continued to affect people across all economic levels in society. Due to the high prevalence of undiagnosed diabetes, it has become very imperative to emphasize screening in any given population, especially in developing countries. **Aim:** The aim of the study was to determine the risk factors and prevalence of diabetes mellitus among participants using the FINDRISC questionnaire. **Materials and Methods:** The study was a cross-sectional study which involved 200 participants but 197 had complete data. Anthropometric, blood pressure, and fasting/random blood glucose measurements were carried out. The data were analyzed using the Statistical Package for the Social Sciences (SPSS) version 23. **Results:** The mean age of respondents was 41.8 ± 16.3 years. There were 104 males and 93 females. Most of the respondents were traders constituting 51.8% of the study population. The 10-year risk categorization of respondents showed that 57.9% had low risk, 17.8% with slightly elevated risk, 12.2% had moderate risk, 10.7% with high risk, and 1.5% with a very high risk of developing diabetes. The average risk score was 7.4 ± 5.4 with a range of 0.0–24.0. The mean weight, height, and body mass index were 69.6 ± 14.4 kg, 165.3 ± 8.6 cm, and 25.5 ± 5.2 kg/m^2, respectively. The mean systolic and diastolic blood pressures were 126.9 ± 20.3 mmHg (range: 80–205) and 76.6 ± 12.9 mmHg (range of 50–130), respectively. **Conclusion:** Approximately, 25% of respondents have a moderate-to-very high risk which emphasizes the need for continuous screening of the population, especially in public gatherings.

Keywords: Diabetes risk, FINDRISC questionnaire, risk factors, screening

Introduction

Diabetes mellitus has become one of the ravaging chronic metabolic illnesses worldwide and invariably, more prevalent in the low-and middle-income countries.[1] The global prevalence of diabetes in 2019 was 9.3% which affected about 463 million persons.[2] About 700 million people will suffer from diabetes by 2045.[2] Furthermore, about one in eight persons aged between 20 and 79 years have their death attributed to diabetes and related complications.[3] The current prevalence of diabetes in Nigeria from a meta-analysis done by Uloko *et al*.[4] was 5.77%, with South-South Nigeria having the highest prevalence of 9.8%, and North Central the least with 3.8%.

The burden of undiagnosed diabetes is also worrisome. Asmelash and Asmelash[5] in a systematic review showed the burden of undiagnosed DM in Africa is more common in urban compared to the rural population (8.63% vs. 3.93%). The authors also demonstrated that the oral glucose tolerance test (OGTT) yielded a higher prevalence rate compared to fasting plasma glucose (8.84% vs. 4.54%). Another systematic review by Dessie *et al*.[6] showed that the average pooled

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prevalence of undiagnosed diabetes mellitus among African adults was 3.85% (95% confidence interval: 3.10–4.60). Based on geographic location, the pooled prevalence was 4.43% in East Africa, 4.72% in Western Africa, 4.27% in Northern Africa, and 1.46% in Southern Africa, respectively.[6] In view of the high prevalence of undiagnosed diabetes in Africa, the authors, therefore, opined that diabetes screening should be given proper consideration.

The debilitating acute and chronic complications of diabetes can impact negatively on the quality of life of the patients and their caregivers. It has been established that the onset of these complications emanates even before the diagnosis of overt diabetes.[7]

Sedentary lifestyles, poor engagement in physical exercise, and dietary indiscretion are some of the predisposing conditions to type 2 diabetes.[8] The market is a point of aggregation of different strata of the population thus, was chosen as a good place for diabetes screening. Moreover, the preponderance of traders in the marketplace is of importance since they are busy and hardly find time for physical exercise and clinic evaluation.

Finnish Diabetes Assessment Risk questionnaire

The Finnish Diabetes Assessment Risk questionnaire is simple and easy to administer to participants. The questionnaire can be interpreted to participants in the local dialect to ensure a better understanding of the contents. The questionnaire was developed by Lindstrom and Tuomilehto for the Finnish Diabetes Association.[9] It has been validated for identifying individuals with risk of type 2 diabetes based on a 10-year prospective population-based study [Table 1].[9] FINDRISC questionnaire has been widely used as a cost-effective screening modality in developed nations as well as in developing nations.[10,11]

Alebiosu *et al*.[12] showed that using the FINDRISC questionnaire among 58,567 participants in a state-wide survey, 58.1% of the participants were within the <7 risk group, 26.9% had diabetes risk of 7%–11%, while 5.6% had the highest risk of >20%. Females also had a higher risk of developing diabetes. The prevalence of obesity was 19.2%, while 28.9% of subjects were overweight in their study. A similar study by Opara *et al*.[13] in Umudike, South East Nigeria among 165 participants showed 66.7% with low risk, 24.2% with slightly elevated risk, and 8.5% with moderately elevated risk. A study done by Nnamudi *et al*.[11] among 134 young adults, Nigerians aged between 15 and 35 years using the FINDRISC questionnaire showed that 1.5% have a high risk while 12% have a moderate-to-high risk of developing diabetes.

Table 1: The categorization of the diabetes risk from the Finnish Diabetes Risk Score questionnaire

Scores	Risk categories
>7	Low risk
7–11	Slightly elevated
12–14	Moderate
15–20	High
>20	Very high

Screening for diabetes mellitus

Diabetes screening is aimed at detecting asymptomatic people with undiagnosed diabetes or detecting those with likely risk of developing diabetes.[11] Different methods have been used such as fasting venous blood glucose, fasting capillary blood glucose, and random blood glucose (World Health Organization [WHO]) estimations. Fasting capillary blood glucose has been reported to show the best equilibrium between specificity and sensitivity for the diagnosis of diabetes at 5.6 mmol.[14] The ADA criteria for diagnosis involve fasting blood glucose ≥126 mg/dl or OGTT two-h postprandial glucose or random blood glucose ≥200 mg/dl obtained on more than two occasions or on one occasion with classical clinical symptoms.[15,16] Prediabetes includes impaired fasting glucose with FBS between 6.1 and 6.9 mmol/l and impaired glucose tolerance with OGTT two-h postprandial glucose or random blood glucose values between 7.8 and 11.0 mmol/L (two-h postprandial glucose.[17] Diabetes screening can involve screening the whole population, selected population, or can be opportunistic.[18] Opportunistic screening involves screening of people who are being attended to by health professionals for other health reasons.[18,19]

Vos *et al*.[20] demonstrated better glycemic control in Type 2 DM patients detected during screening compared to those diagnosed during usual care sessions. Three cohorts were compared: 10-year screen-detected type 2 DM patients, and type 2 DM patients detected by usual care sessions of seven- and 10-year duration, respectively. The respective HbA1C was 50.1 mmol/mol, 51.8 mmol/mol, and 52.8 mmol/mol. The respective requirements for insulin were noted in 10.5%, 14.7%, and 19% in the three cohorts.[20]

Materials and Methods

The study was carried out at the International Market, Ebonyi State after proper sensitization of a screening program in the market. Participants included adults from 20 years and above who were not diagnosed to have diabetes mellitus previously. The FINDRISC questionnaires were interviewer-administered to the participants after obtaining informed consent. Measurements of fasting blood glucose and random blood glucose were taken using Accu-Check Glucometers (Roche Diagnostics, German). The weight and height of participants were also measured using a stadiometer (SECA, Steindham, Hamburg-Germany, 2013) with an attached weighing scale. The waist circumference and hip circumference were measured using a stretchable measuring tape. Ethical clearance for the study was obtained from the Ethics and Research Committee of the Alex Ekwueme Federal University Teaching Hospital, Abakaliki. Ethical clearance number: AE-FUTHA/REC/VOL 3/2022/087.

The data obtained from the study were analyzed using the Statistical Package for Social Sciences (SPSS) IBM-SPSS for Windows version 23 (IBM Corp., Armonk, N. Y., USA).

Results

Data were obtained from 197 participants and analyzed. The tables and figures are shown after the reference section [Tables 2-6 and Figure 1].

Discussion

Most of the participants (57.9%) [as shown in Figure 1] had a low risk of developing diabetes which is similar to other studies by Opara *et al*.[13] and Saleem *et al*.[21] who reported 66.7% and 53.50%, respectively. The individuals with a moderate and high risk of diabetes constituted 12.2% and 1.5% which are similar to 10.5% and 1.5% reported by Nnamudi *et al*.[11]

The proportion of participants with elevated blood glucose above the normal range from the study was 48.6% [Table 4] which was higher than the 32.80% found by Nnamudi *et al*.[11] Nnamudi *et al*.[11] studied a cross-section of young persons which may account for the lower prevalence. Those with overt diabetes mellitus accounted for 11.2% of the study subjects. This is in keeping with the finding of Ekpenyong *et al*.[22] who reported a prevalence of 10.51% in Uyo Metropolis. However, our finding is higher than that of Ezeani *et al*.[23] who reported a prevalence of 3.3% from a house-to-house survey done in Abia State, South Eastern Nigeria. The higher prevalence may be as a result of the participants in this study who were mainly traders/shop owners in a market who have a greater tendency to sedentary lifestyles and dietary indiscretion.

Daily physical exercise of 30-min duration was optimal as 54.3% of participants indicated positive responses [Table 5]. However, a study by Akarolo-Anthony and Adebamowo[24] showed that more than 80% of urban Nigerian professionals do not meet up with the WHO recommendations of physical activity. The finding from our study may be due to an increase in awareness of the importance of physical exercises in the environment. Moreover, the study by Akarolo-Anthony and Adebamowo[24] was strictly among professionals. From both bivariate and multivariate analysis in our study, daily physical exercise has statistical significance in preventing the development of diabetes mellitus ($P < 0.001$, respectively) [Table 6]. Those who were involved in physical exercise have approximately six times less risk of developing diabetes than those who did not involve themselves. Some

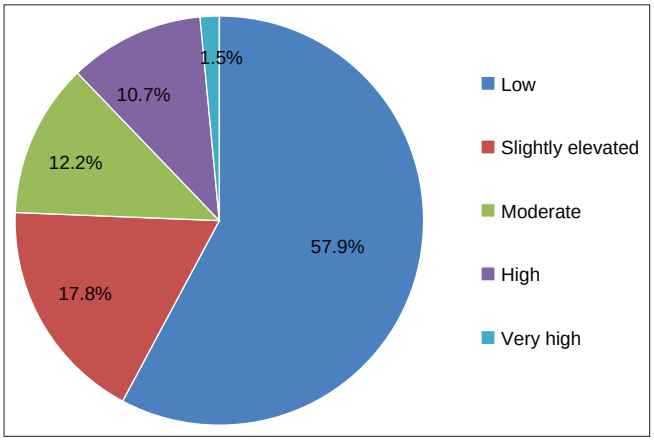

Figure 1: Respondents' Type 2 diabetes mellitus 10-year risk categorization using FINDRISC questionnaire

Table 2: Sociodemographic characteristics of respondents

Variable	Frequency (n=197), n (%)
Age group (years)	
24 years or less	31 (15.7)
25-34	49 (24.9)
35-44	34 (17.3)
45-54	35 (17.8)
55-64	28 (14.2)
65 years or more	20 (10.2)
Mean age (years)	41.8±16.3*
Sex	
Female	93 (47.2)
Male	104 (52.8)
Occupation	
Trading	102 (51.8)
Civil service	36 (18.3)
Farming	17 (8.6)
Driving	11 (5.6)
Student	9 (4.6)
Health worker	5 (2.5)
Others	17 (8.6)

*Mean±SD. SD: Standard deviation

Table 3: Anthropometry of respondents

Variable	Mean±SD (n=197)	Range
Weight (m)	69.6±14.4	41.5-107.0
Height (cm)	165.3±8.6	143.0-190.0
Body mass index	25.5±5.2	16.0-44.0
Waist circumference (cm)	88.1±14.1	35.0-126.0
Hip circumference (cm)	100.4±11.5	74.0-136.0
Neck circumference (cm)	36.4±4.7	13.0-77.0
Waist-hip ratio	0.88±0.1	0.33-1.12

SD: Standard deviation

Table 4: Distribution of blood glucose measurements among respondents

Variable	Frequency (%)
FBS (mg/dl) (n=123)	
Normal (70-100)	65 (52.8)
Impaired fasting glucose (101-125)	37 (30.1)
DM (≥126)	21 (17.1)
RBS (mg/dl) (n=74)	
Normal (<200)	73 (98.6)
DM (≥200)	1 (1.4)
Blood sugar status (FBS or RBS) (n=197)	
Normal (FBS <126 or RBS <200)	175 (88.8)
DM (FBS ≥126 or RBS ≥200)	22 (11.2)

FBS: Fasting blood sugar, RBS: Random blood sugar, DM: Diabetes mellitus

authors have demonstrated that physical exercise such as walking had an appreciable reduction in the risk of diabetes mellitus by 20%–30% in women.[25] Physical exercises result in acute and chronic improvements in insulin sensitivity and may account for the significant effect reported.[26]

The intake of vegetables was suboptimal as shown by 29.4% of respondents consuming vegetables on daily basis [Table 5]. A study by Banwatt *et al*.[27] in Jos, North Central Nigeria, showed adequate knowledge (92.4%) of nutritional values of fruits and vegetables but a much more reduced practice of consumption of these items (69.2%). An online survey by Raaijmakers *et al*.,[28] which involved 1632 women in Lagos and Ibadan reported that respondents consume 2.6 portions of vegetables per day which was below recommendations. The participants who take vegetables and fruits daily had a reduced risk of developing diabetes by approximately 1.2 times. Fruits and vegetables have a high content of flavonoids and antioxidants which inhibit the process of oxidative stress that contributes to the development of diabetes.[29]

Thus, there is a need to emphasize the need for vegetable consumption on daily basis and in the right proportions. Such a recommendation has also been made by Chibike *et al*.[30] in their study that evaluated vegetable consumption in South Eastern Nigeria.

Among the participants in our study, 33% have been previously diagnosed to have systemic hypertension and are taking antihypertensive medications [Table 5]. This is in keeping with a nationwide survey by Odili *et al*.[31] with reported overall hypertension prevalence of 38.1% though the regional prevalence in South East was 52.8%. These findings depict a higher burden of hypertension among Nigerians and emphasis on awareness and subsidizing the antihypertensive medications is therefore very crucial.

The prevalence of diabetes in first-degree relatives was 14.2% [Table 5]. The finding is lower compared to the finding of 26.6% reported by Ma *et al*.,[32] in Chengdu though, a larger population of 535 first-degree relatives was evaluated. However, a similar finding was obtained by Xiong *et al*.[33] where the prevalence of one or more family degree relatives with diabetes was 18.7% and 12.8%, respectively, though the study was carried out among 8909 type 2 diabetes patients which were far greater than our study population.

Table 5: Practices about risk factors of Type 2 diabetes mellitus

Variable	Frequency (*n*=197), *n* (%)
Having daily at least 30 min of physical activity at work and/or during leisure time	
Yes	107 (54.3)
No	90 (45.7)
Frequency of eating vegetables, fruit, or berries	
Every day	58 (29.4)
Not every day	139 (70.6)
Ever taken medication for high blood pressure on regular basis	
Yes	65 (33.0)
No	132 (67.0)
Ever been found to have high blood glucose	
Yes	22 (11.2)
No	175 (88.8)
Members of immediate family or other relatives ever been diagnosed with diabetes (Type 1 or Type 2)	
Yes	28 (14.2)
No	169 (85.8)

Conclusion

In view of the complications of diabetes mellitus, the benefits of screening individuals with the aim of identifying those at risk cannot be overemphasized. The significant roles of physical exercise and intake of fruits and vegetables were deduced from the study and should be emphasized to individuals as effective lifestyle measures. Moreover, regular screening of individuals

Table 6: Factors associated with 10 years risk for Type 2 diabetes mellitus among respondents

Variable	Risk for Type 2 DM		Bivariate analysis		Multivariate analysis		
	Absent, *n* (%)	Present, *n* (%)	cOR	*P*	aOR	*P*	95% CI for aOR
Age (years)							
≤42	78 (72.2)	30 (27.8)	11.863	<0.001	1	<0.001	7.829-43.182
≥43	16 (18.0)	73 (82.0)			18.387		
Sex							
Female	60 (57.7)	44 (42.3)	2.366	0.003	1	<0.001	2.427-12.735
Male	34 (36.6)	59 (63.4)			5.559		
Daily at least 30 min of physical activity							
No	66 (61.7)	41 (38.3)	3.564	<0.001	1	<0.001	0.075-0.380
Yes	28 (31.1)	62 (68.9)			0.169		
Frequency of eating vegetables, fruit or berries							
Not every day	23 (39.7)	35 (60.3)	0.629	0.143	1	0.658	0.363-1.897
Every day	71 (51.5)	68 (48.9)			0.830		

cOR: Crude odds ratio, aOR: Adjusted odds ratio, DM: Diabetes mellitus, CI: Confidence interval

in different public fora should be emphasized in our public health system so as to enhance the rate of detection of people with diabetes mellitus.

Authors' contributions

Conceptualization of the topic and Manuscript writing-UCV, Data collection/Literature Search-BIN, NCA, KEO, EC, CMA, Data analysis–CKO. Review and editing-BCE, OMM.

The mean age of respondents was 41.8 ± 16.3 years. There were 104 males and 93 females

Table 6 shows that individuals aged 43 years and above are over 18 times more likely to be at risk of type 2 DM than those who are younger. Males are about 5.5 times more at risk of type 2 DM than females. People who engage in at least 30 min of physical activity per day and those who eat vegetables, fruits, or berries every day are 5.9 times and 1.2 times, respectively, as likely to be at risk of DM as their counterparts.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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