Nor. Afr. J. Food Nutr. Res. 2022; 6 (14): 144-153

https://doi.org/10.51745/najfnr.6.14.144-153

https://www.najfnr.com

ORIGINAL ARTICLE

Prevalence of prediabetes in an urban Nigerian population using the Finnish Diabetes Risk Score

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ABSTRACT

Background: Type 2 Diabetes Mellitus (T2DM) is a global problem in emerging economy Nigeria. Early detection can help delay or prevent the disease. **Aims:** This study aims to characterize the prevalence of prediabetes in the study population using the validated Finnish Diabetes Risk Score (FINDRISC) in the adult population in an urban Sagamu Ogun State South-Western Nigeria. **Patients and Methods:** Healthy participants (n=581) aged 18-65yrs with no known history of T2DM or pregnancy were recruited from local urban churches in Sagamu. The FINDRISC questionnaire was then administered, which included questions on age, BMI, waist circumference, vegetable consumption, physical activity, history of high blood pressure, family history of T2DM and history of high blood sugar. **Results:** Overall, 51.8% of the participants were assigned a risk of developing T2DM in the next 10 years, with a range of categories from slightly elevated to very high risk; 34.4% of the participants had a risk score of 7-11, indicating a slightly elevated risk; 11.2% of the participants had a risk score of 12-14, indicating a moderately elevated risk, while 5.3% of the participants had a risk score of 15-20, indicating a high risk and 0.9% of the participants had a risk score higher than 20 indicating very high elevated risk. The gender distribution of the risk scores showed that 1.7% of the males and 9.5% of the females had a moderate to high risk (score ≥ 12) of developing T2DM in the next 10 years. The FINDRISC score was positively and significantly correlated with body weight (r = 0.49; p <0.001), BMI (r = 0.55; p <0.001) and age (r = 0.27; p <0.001). This prevalence of prediabetes is similar to that found in other studies in Nigeria. **Conclusion:** This study confirms the use of this simple and non-invasive screening tool for T2DM among adults in Nigeria. It is also a useful tool to increase awareness of this condition in the population.

ARTICLE INFORMATION

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Received: June 01, 2022
Revised: November 29, 2022
Accepted: December 02, 2022
Published: December 07, 2022

Article edited by:
- Pr. Meghit B. Khaled

Article reviewed by:
- Pr. Rachid Malek
- Pr. Fatima Zohra Laamiri

Keywords.
Prediabetes, T2DM, FINDRISC, BMI, risk score.

1 Introduction

Few studies have been undertaken on Type 2 Diabetes Mellitus (T2DM) prevalence in Nigerians [1]. The last national health survey in Nigeria was in 1992, and the Prevalence of T2DM was 2.2% [2]. The South-South zone has the highest Prevalence in Nigeria at 9.8% [3]. Nigeria is the 'giant of Africa' continent with the most population, and the country is reported to have Africa's highest burden of T2DM [4, 5]. The onset of T2DM is usually preceded by prediabetes marked by impaired glucose tolerance (IGT) or impaired fasting glucose (IFG), which is linked with resistance or deficiency of insulin [6]. Therefore, the onset can be delayed with a timely and appropriate intervention if people at risk are identified early [7]. Nigeria has a high unemployment rate, and this is coupled with inadequate income, a lower rate of education, and physical complications, which have unfavorably affected patients' quality of life with T2DM [8]. The use of standard diagnostic tools such as the Oral Glucose Tolerance Test (OGTT) and HbA1c becomes expensive. Therefore, finding alternative cost-effective, developed, tested, cheaper, and easy-to-use diagnosing prediabetes tools in other countries is crucial in Nigeria. One affordable and easy to use screening tool is the Finnish Diabetes Risk Score (FINDRISC) [9].

The Finnish Diabetes Prevention Study initially used the FINDRISC questionnaire as a screening tool to effectively identify at-risk individuals of developing T2DM within 10 years [6]. The FINDRISC has been widely adopted as a low-cost screening tool in several countries to assist early identification of individuals at risk of T2DM who might benefit from early preventive interventions [10-15]. For example, a study in Spain [16] showed that the FINDRISC questionnaire could predict current undiagnosed diabetes and prediabetes as defined by glucose-based diagnostic criteria in a Spanish population. The FINDRISC tool has been validated in several other studies for early diagnosis and prevention of T2DM in adult populations [17]. In addition, several studies

have been conducted to test the effectiveness of FINDRISC in screening for T2DM and other chronic diseases, with promising results [14]. A validation study performed in the Peruvian adult population, comprising adults aged 30 - 69 years, indicating the FINDRISC score has high sensitivity and specificity in predicting unknown T2DM [13].

A few studies have used the FINDRISC tool on adults as 10 years risk predictors in Africa. A study used the Finnish Diabetes Risk Score's validity to detect undiagnosed T2DM among general medical outpatients in Botswana, Africa [12]. The Prevalence of undiagnosed T2DM in the study increased gradually with the increase in FINDRISC scores. The overall score accuracy of this study is not different from similar studies conducted on other populations, such as those performed on the Spanish people. However, it has been observed that the prevalence of prediabetes and diabetes is more common in urban than rural settings [18]. The FINDRISC tool has been modified to be relevant to the African perspective by validating the tool by taking blood samples from people at risk of T2DM [19]. In an Algerian population [20], observed that the developed risk score tool helps decide who should be screened for prediabetes or T2DM by blood sample analysis.

In Nigeria [21], used the Finnish Diabetes Risk Score (FINDRISC) to determine the risk levels of adults in Nigeria for T2DM. The study was conducted in a hospital in 2011 at Ile Ife, Southwestern Nigeria, and found that the Finnish Diabetes Risk Score is a useful non-invasive method of screening in the Nigerian environment. It recommends using a self-administered questionnaire to know their risk levels early and adopt appropriate lifestyle modifications. Furthermore [22], a cross-sectional study of participants recruited from semi-urban communities aged 18 years and older studied the performance of the Finnish Diabetes Risk Score (FINDRISC) questionnaire for screening individuals with undiagnosed T2DM and Dysglycemia in adults in Ekiti state, southwest, Nigeria. The study also found the FINDRISC tool a practical tool to screen for undetected diabetes and the potential development of diabetes among high-risk groups in the semi-urban community. Therefore, this study aimed to characterize the prevalence of prediabetes in an urban population in Southwestern Nigeria.

2 Patients and Methods

Healthy male and female participants aged 18 – 65 with no history of having T2DM or pregnancy from local churches were invited for prediabetes using the FINDRISC tool in this study.

We initially recruited 600 participants; however, we had 581 adults who met the inclusion criteria of being 18-65 years old and not known to have a clinical diagnosis of T2DM or pregnancy. The minimum sample size for the study was determined using the formula (n = Z2pq/d2) for calculating sample size for health studies [23], and the minimum size was 182. The inclusion criteria for all participants screened for high risk of diabetes using the FINDRISC tool, and exclusion criteria will be for all participants diagnosed with T2DM and pregnant. The participants were recruited from local churches in Sagamu, an urban environment and all participants provided written informed consent.

2.1 Data collection and measurement

2.1.1 FINDRISC Risk score

Participants' information was obtained using the FINDRISC questionnaire; a one-page questionnaire was administered to all participants by the researchers and trained assistants in the study. The following parameters were recorded as part of the FINDRISC risk score: age, level of physical activity, use of vegetables, history of high blood pressure, history of high blood glucose and family history of diabetes. A score of “3” was recorded if there is the presence of a family with a History of T2DM aunt, uncle or first cousin, grandparent, or “5” if it occurred in a brother or sister, the parent or “0” if there was no family history of T2DM. The score of zero “0” was recorded if there was the consumption of fruits or vegetables if the participants consumed fruits/vegetables daily or scored “1” if they did not. Any participants that took anti-hypertensives regularly were scored “2”, and those that did not were scored zero “0”. Daily exercise of at least 30 minutes was scored zero “0” if positive and “2” if negative. The presence of high blood glucose in past examinations was scored “2” if it was positive or zeroed “0” if it was negative. Body Mass Index (BMI) <25 was scored zero “0”, 25-29.9 was scored “1”, while ≥ 30 was scored “3”. Age (in years) <45 was scored zero “0”, 45-54 was scored “2”, 55 - 64 was scored “3”, while 65 and above was scored “4”. A waist circumference of <95cm in a male and 80cm in a female was scored zero “0”, 95-102cm in a male and 80-88cm in a female was scored “3”, while >102cm and >88cm in a female was scored “4”. The risk score values range from 0–25. Finally, the individual scores were added to provide a unit FINDRISC score for every participant. Most of the participants are educated however the researcher assistants help a few participants interpret the form for those who cannot understand English to the local dialect of Yoruba. Risk categories were identified in the FINDRISC standard groups of low risk (<7), slightly elevated (7-11), moderate (12-14), high (15 -20) and very high risk (>20).

2.1.2 Anthropometric measurements

Participant's Body mass index (BMI) was determined using the formula weight (kg)/Height (m2), and the weight of participants was selected to the nearest 0.1 kg using an electronic body weight scale (Seca 813 Robusta Digital Scales), with the participants' lightly clothed. The height was

calculated to the nearest 0.5 cm with a non-stretchable measuring tape while the participants stood still without shoes. The Waist circumference (WC) is a precise and simple measure of abdominal obesity compared to the waist-hip ratio (WHtR). It is measured at the broadest abdominal circumference, which is about the umbilicus, or at the middle between the lower ribs margin and the upper margin of the iliac crest. The waist-to-height ratio (WHtR) is a proxy for central (visceral) adipose tissue, which has recently received awareness and attention as a marker of 'early health risk' [24]. The use of simple boundary value for WHtR (0.5) has been used around globally, and findings in numerous populations have supported the evidence that WHtR is a simple and effective anthropometric index to identify early health risks' associated with central obesity than a more complex 'matrix' using traditional boundary values for BMI and WC [25].

2.1.3 Statistical Analysis

The SPSS version 28 (IBM SPSS) was used for data entry and analysis. Quantitative variables (age, body weight, BMI, WHtR, WHR and WC.) were expressed as mean ± standard deviation. Furthermore, qualitative variables were presented in frequency and percentages (%). Comparison between the male and female participants were made using chi-tests with significance level set at $p < 0.05$, after checking the data was normally distributed.

3 Results

3.1 Characteristics of the participants and prevalence of T2DM in the population

In this study of 581 adults, 198 (34.1%) were male, and 383 (65.9%) were female (Table 1). The age of the participants is from 18 to 65 years, with a mean age of 43.

Table 1. Characteristics of the study population

Characteristics	Population n= 581	
	Frequency	Percentage (%)
Gender		
Male	198	34.1
Female	383	65.9
Age (Years)		
Under 45	298	51.3
45-54	132	22.7
55- 64	96	16.5
Over 65	55	9.5
BMI (kg/m²)		
Lower than 25kg/m²	256	44.1
25 -30kg/m²	199	34.3
Higher than 30kg/m²	126	21.7

The values (mean ± SD) of participants' age, body mass index (BMI), body weight, waist circumference (WC.), and FINDRISC risk score are presented in Table 2 (The Anthropometric data of the participants).

The mean FINDRISC score of this study is 7.9. Overall, 51.8% of the participants have slightly elevated to a very high risk of T2DM. The female participants in the study recorded higher body mass index (BMI), waist circumference (WC), and FINDRISC risk score values compared to the male participants in the study population. In Table 3 (FINDRISC Characteristics of the study population), 15.1% have a positive family history, 56% were overweight or obese, 52% had limited physical activity, and 48% were physically active. Only 37% of participants daily take vegetables and fruits, while 63% did not take them daily.

Table 2. Distribution of anthropometric data and FINDRISC score by sex

Participants (n=581)	Age (Years)	Body weight (Kg)	BMI (kg/m²)	WC (cm)	FINDRISC Risk Score
	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD
Male	41.4 ± 11.4	69.2 ± 12.8	24.7 ± 4.7	83.9 ± 11.8	5.7 ± 4.5
Female	43.1 ± 12.1	69.9 ± 16.8	27.4 ± 6.5	87.9 ± 14.1	7.9 ± 4.5

As reported in Table 4 (BMI distribution of the participants), 37 (6.4%) of the participants had a BMI less than 18.5, indicating underweight or malnutrition; 227 (39.1%) had a BMI less than 25, signifying a healthy weight; 165 (28.4%) had a BMI of 25–29.9 indicating overweight/pre-obese, 102 (17.6%) had a BMI 30 - 34.9 indication obese class1, 30 (5.2%) had a BMI of 35 - 39.9 indication obese class 11, 20 (3.4%) had a BMI more than 40 indications obese class 111, and 152 (26.2%) in the study had a BMI greater than 30, indicating obesity. Considered together, 225 (38.7%) participants were either overweight or obese (BMI≥25). The results showed that 111 (56%) of the males and 116 (30.3%) of the females had a healthy body weight, and 38.3% of the males and 62.9% of the females were overweight or obese (Table 4) (BMI distribution of the participants).

Table 5 (Distribution of risk score among participants) displays the risk score distribution in the entire study population. It shows that 280 (48.2%) of the participants had a risk score of less than 7, indicating a low risk; 200 (34.4%) of the participants had a risk score of 7-11, indicating a slightly elevated risk; 65 (11.2%) of the participants had a risk score 12-14, indicating a moderately elevated risk while 31(5.3%) of the participants had a risk score 15-20, indicating a high risk and 5 (0.9%) of the participants had a risk score higher than 20 indicating very high elevated risk. Taken together, 65 (11.2%) of participants had a moderately elevated to high risk (score ≥12) of developing T2DM in the next 10 years. In addition, the gender distribution of the risk scores in (Table 5)

showed that 125 (21.5%) of the males and 155 (26.7%) of the females had a low risk (score <7) while 10 (1.7%) of the males and 55 (9.5%) of the females had a moderate to high risk (score ≥ 12) of developing T2DM in the next 10years.

Table 3. FINDRISC characteristics of the study population

Characteristics	Total Population n=581(%)	Male	Female
WC (cm)		**n=198 (%)**	**n=383 (%)**
Less than 94/80	284(48.9)	159(80)	125(32.6)
94 -102/80-88	95(16.4)	25(12.6)	70(18.3)
More than 102/88	202(34.8)	14(7)	188(49.1)
The family have a history of being diagnosed with diabetes			
None	493(84.9)	55(80.9)	483(85.4)
Yes (grandparents, aunt, uncle, first cousin	25(4.3)	2(2.9)	23(4.5)
Yes (parents, brother, sister, child)	63(10.8)	11(16.2)	52(10.1)
Tested to have high blood glucose			
No	551(94.8)	64(94.1)	487(94.9)
Yes	30(5.2)	4(5.9)	26(5.1)
Have taken medication for High blood pressure regularly.			
No	473(81.4)	62(91.2)	409(79.7)
Yes	108(18.6)	6(8.8)	104(20.3)
Daily Physical Activity			
No	302(52)	40(58.8)	261(51.1)
Yes	279(48)	28(41.2)	251(48.9)
Daily intake of fruits/vegetables			
No	366(63)	44(69.1)	319(62.2)
Yes	215(37)	24(30.9)	194(37.8)

The FINDRISC score was positively and significantly correlated with body weight (r = 0.49; p <0.001), BMI (r = 0.55; p <0.001), age (r = 0.27; p <0.001) and WC (r = 0.64; p <0.001).

Table 4. BMI distribution of the participants (n =581)

WHO classification of obesity	(BMI)	Participant Frequency n=581 (%)	Male (%)	Female (%)	p-value
Underweight	< 18.5	37(6.4)	11(5.6)	26(6.8)	<0.001
Normal range (Healthy weight	18.5 - 24.9	227(39.1)	111(56)	116(30.3)	0.000
Overweight (Pre-obese)	25 - 29.9	165(28.4)	49(24.7)	116(30.3)	0.000
Obese class I	30 - 34.9	102(17.6)	22(11.1)	80(20.9)	<0.001
Obese class II	35 - 39.9	30(5.2)	3(1.5)	27(7)	<0.001
Obese class III	≥ 40	20(3.4)	2(1)	18(4.7)	<0.001

BMI: Body Mass Index

Table 5. Distribution of risk scores of the participants (n=581)

Risk score	Risk	Study Population n = 581 (%)	Male (%)	Female (%)	p-value
<7	Low	280(48.2)	125(21.5)	155(26.7)	<0.001
7 -11	Slightly Elevated	200(34.4)	53(9.1)	147(25.3)	<0.001
12 -14	Moderate	65(11.2)	10(1.7)	55(9.5)	<0.001
15 – 20	High	31(5.3)	8(1.4)	23(4)	<0.001
> 20	Very High	5(0.9)	2(0.3)	3(0.5)2	0.004

4 Discussion

The study was carried out to characterize the prevalence of prediabetes in the study population aged 18-65 years in Sagamu, an urban town in Ogun State, South-Western Nigerian, using the FINDRISC tool. A study in 2013 by [26] in Ogun State, South West and a few studies in Nigeria have only been used in the effectiveness of the FINDRISC questionnaire [26].

In this study, the mean ± SD score of the FINDRISC score is 7.9 ± 4.5, with the males having a mean FINDRISC score of 5.7 ± 4.5 and females 7.9 ± 4.5. The FINDRISC score result is higher than that [25]; in an adult study in Nigeria, the mean ± SD total risk score of 5.6 ± 3.9. However, the result is lower with a high mean score of the Finnish Diabetes Risk Score (FINDRISC) for undiagnosed T2DM found in the Algerian population, with the average FINDRISC being 12.50 ± 3.82 in women and 10.47 ± 3.72 in men [27] and a Peruvian population with 8.9 ± 4.2 (range: 0–24) points [13]. In addition, the mean score of this study is slightly higher than the mean FINDRISC score, 6.8 ± 4.7 for the Belgian population [28], and lower compared to the mean FINDRISC score of 8.72±4.95 for the Turkish population [29].

11.2% of participants had a moderately elevated to high risk (score ≥12) of developing T2DM in the next 10 years, and 5.3% of the participants had a risk score of 15-20, indicating a high risk in this study. Earlier findings among adults and the elderly in a Nigerian population using the FINDRISC tool reported a 9% elevated risk of developing T2DM [30]. A study by [31] of young adults in Nigeria found an 8.5% moderately elevated risk and 0.6% high risk of developing diabetes mellitus within the next ten years. Whilst using the FINDRISC tool [26], noticed an 8.6% high to very high risk of developing T2DM within 10 years in Ogun state. A study by[22] noticed that 13.73% of the participants in Ekiti state, Nigeria had high to very high diabetes risk scores.

The result of this study is slightly similar to the findings of a study conducted by [32] in a study in Abuja, Nigeria, with participants found to be 11.7% at moderate risk, 7% at high risk, and only 0.5% were at very high risk. In Pakistan, Haastrup et al. [32] found that the participants had 11.2% moderate risk, and 6.6% had a high risk of developing T2DM in the next 10 years. Also, in a Polish population, the women had significantly higher FINDRISC scores than men (10.43 vs 8.91; p = 0.000), and the population had 38.9% slightly elevated risk, 16.8% moderate risk, 16.4% high risk and 2.0% very high risk [34].

It is pertinent to know that there is a conventional practice of adopting different FINDRISC cut-off values by various authors in identifying individuals at high risk. The studies that have previously adopted a FINDRISC score above the cut-off value of 12 found that 12% of the participants had a moderate risk, and 10.58% had a high or very high risk [35]. A study on the working population of Belgium also found that 12% had a FINDRISC score of moderate risk, and 5.5% had a score of 15 or more, corresponding to high risk [28].

In this study, the high BMI observed among the female participants might not be unrelated to the fact that the participants live in an urban settlement but also linked with other risk factors, including lifestyle and physical inactivity and dietary intake. A study conducted by Awosan et al. [36] among traders in Sokoto, North of Nigeria, showed a high prevalence of overweight, obesity and hypertension. Furthermore, Chinenye & Ogbera [37], in a study conducted in Nigeria, found that T2DM is more frequent among some tribal women than men and linked this to lifestyle, diet, and cultural factors. In Oke - Ogun, South West, Nigeria, Rasaki et al. [2] found that T2DM is more common among females below 61 years due to abject poverty. The Iloh et al.'s study [38] found that T2DM was more prevalent in middle-aged adults than in younger adults in Nigeria. The increased T2DM is associated with the rapid urbanization in Nigeria and the lack of knowledge of most people not eating their local healthy foods and instead eating processed foods [39]. A cross-sectional study among market women in Southwest Nigeria revealed the high prevalence of overweight and obesity [40]. The study attributed the eating habit to increasing the traders' risk of developing overweight and obesity, triggering other non-communicable diseases. Another study found that market women form the more significant proportion of traders in Nigerian markets, and they sit down for long hours and engage in sedentary activities [41].

Similar to this study in Nigeria, the FINDRISC questionnaire also observed a significantly high Body Mass Index (BMI) in the population residing in urban and semi-urban communities in Nigeria. For example, Nnamudi et al. [15] found that 43.2% of Asaba, Delta State study participants were overweight or obese. Likewise, Agu et al. [42] noticed that 42.6% of the study population in Onitsha, Anambra State were obese. In addition, the female participants in this study had a higher BMI (27.3 ± 6.5 vs 24.7 ± 4.7) and a higher mean FINDRISC score of (7.9 ± 4.5 vs 5.7 ± 4.5) compared to the male participants.

This study result is significantly similar to a study in Abuja, Nigeria, by Nnamudi et al. [15], with the female participants having higher mean values of BMI (25.4 ± 5.4 vs 24.9 ± 3.4) and high mean FINDRISC score (7.3 ± 3.4 vs 4.9 ± 3.2) relative to the males. Another study in India showed that urban women in India displayed higher levels of overweight and obesity due to unfavorable diets and lower physical activity levels when compared to rural women [43].

Overweight and obesity are health issues and are risk factors for many non-communicable diseases (NCD) [34]. The current study is similar to the reported pattern in an earlier study among adult Nigerians. The Opara et al.'s study [31] noticed that females had a higher mean BMI (24.7 ± 2.9) than male with BMI (22.0 ± 2.4). More also, Alebiosu [44] found that females had elevated BMI (25.3 ± 4.35) than males (26.12 ± 6.22).

The present study's prevalence of overweight and obesity may be associated with a sedentary lifestyle because it was conducted in an urban town. A high prevalence of sedentary lifestyle and obesity was reported among urban people in Nigeria [42]. According to Adeloye et al. [45], the observed prevalence rates of overweight and obesity were constantly elevated among urban residents than rural dwellers. Urbanization is one of the significant contributors to obesity worldwide, and there is a relationship between obesity and T2DM [46]. A study of women aged 19–65 selected from five major markets in Abeokuta Township, Ogun state, found a high risk of obesity among urban market women. The study, therefore, suggested the importance of educating the market women about their dietary intake and lifestyle to address obesity among the market women who fall within the country's low-income earner groups [47].

Our study showed that 52% of the whole participants being physically inactive; 58.8%, of the males versus 51.1% of the females (Table 3) (FINDRISC Characteristics of the study population). The obtained results are slightly comparable to those obtained by Haastrup et al. in Abuja [32] are remain higher than other FINDRISC studies in Nigeria [26, 30]. The high prevalence of physical inactivity recorded in our investigation might be connected with age, lifestyle, and urbanization. For example, Chigbu et al. [48] noticed the high

burden of physical inactivity 32.68% in south-eastern Nigeria. Therefore, the study can be deduced that living in urban areas and increasing age are associated with increased physical inactivity. Furthermore, Hjerkind et al. [49] noted that overweight and obesity are associated with a significantly increased risk of T2DM, mostly among those who reported being physically inactive. Therefore, the current study has evidenced the crucial need to address the significant sedentary lifestyle in the population to decrease the risk of T2DM.

Table 3 (FINDRISC Characteristics of the study population) shows that most (63%) of the participants do not consume vegetables or fruits daily. The result was slightly elevated in the male (69.1%) compared to the female (62.2%) population. This present study results are in line to other Nigerian FINDRISC-based studies [32] and [26]. For example, 77.5% of the study population in Abuja do not consume vegetables or fruits daily [32], while Alebiosu et al. [26] observed that only 27.8% of the study population in Ogun state consume vegetables, fruit or berries every day. Other studies, such as that of Molina et al. [50] conducted on a Colombian population, found that 26.9% of the urban area residents consume fruits and vegetables regularly with an average FINDRISC score (11 ± 4.9). A study population in Ouagadougou (Burkina Faso) found that 84.4% did not consume vegetables, fruits, or berries daily [14]. A significant contributor to disease worldwide is the low consumption of fruit and vegetables [51].

There is an increasing burden of T2DM in Nigeria, with numerous undiagnosed persons and few known treatment cases [5]. This study has shown that using a simple, validated, feasible, and cost-effective method for people with elevated risk, especially in resource-tight countries such as Nigeria, will benefit the population. The associated risk factors with prediabetes and T2DM in Nigeria include obesity, overweight, family history, alcohol misuse, physical inactivity, hypertension, polycystic ovarian syndrome, and hyperlipidemia [52]. Therefore, there is a need for lifestyle changes in the study population. A study conducted by Alouki et al. [53] suggested that lifestyle interventions have effectively prevented T2DM. Dietary modification, regular physical activity, smoking cessation, and other lifestyle changes positively affect T2DM and cardiovascular diseases [54].

The findings in this study attested to the other studies conducted in Nigeria and other countries' population studies. Several factors can be accounted for the risk factors in the study population, as found in these findings. However, careful attention and consideration should be offered to the study findings regarding the generalizability. The study used volunteers from local churches rather than the whole community population and had a relatively small sample size. In addition, there is a tendency for the participant to under-report or not report negative characteristics and still amplify positive attributes due to cultural and religious beliefs. Several populations have different beliefs and behaviors, which are essential in managing diseases [55]. However, the study shows that the FINDRISC tool is inexpensive and useful in predicting T2DM.

5 Conclusions

This study revealed that 11.2% of participants had a moderately elevated to high risk (score ≥12) of developing T2DM in the next 10 years and 5.3% of the participants had a risk score 15-20, indicating a high risk of developing T2DM within the next 10 years. The findings highlight that the FINDRISC tool is an effective diagnostic tool for assessing T2DM risk within a 10-year.

Acknowledgement: We thank the Minister in charge of the local churches and the Ogun State Ministry of Health for permission to conduct this study. Furthermore, we sincerely thank all participants who participated in this study.

Ethical Approval and Consent to Participate: Ethical approval was requested from the Ethics committee of the London Metropolitan University and the Ministry of Health, Ogun State, Nigeria. The Minister in Charge of all the Local Churches permitted the study to be conducted. Verbal and written informed consent were requested from each participant who signed informed consent before participation and after explaining the purpose of the study. Laboratory results were communicated to the participants for further management. Furthermore, numbers and codes were used during data analysis and interpretations to ensure confidentiality.

Author Contribution: DB & OSS conceived and designed the study and undertook the literature research. All authors participated in the experiment and data acquisition. OSS performed the data analysis and statistical analysis while DB reviewed the drafted manuscript. All authors approved the final version before submission. In addition, all authors have read and agreed to the published version of the manuscript.

Conflicts of Interest: The authors declare no conflicts of interest regarding the publication of this paper.

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Cite this article as: Sowunmi, O. S., and Bhakta, D. (2022). Prevalence of prediabetes in an urban Nigerian population using the Finnish Diabetes Risk Score. *The North African Journal of Food and Nutrition Research, 6* (14): 144-153. https://doi.org/10.51745/najfnr.6.14.144-153