

# Knowledge of Diabetes Risk Factors among Market Women in Orisunbare Osogbo, Osun State, Nigeria

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## Abstract

**Background:** Diabetes is a life-threatening disease that has become a global threat to public health. Hence, it is a fast-growing chronic disease that affects not only diabetic patients, but also society at large. This study examined the level of knowledge about diabetes risk factors among market women in Orisunbare Osogbo, Osun State, Nigeria.

**Methods:** A descriptive quantitative design was conducted among 274 respondents. We used a questionnaire for data collection. A descriptive analysis was performed using frequencies and percentages, and a chi-squared test was used to determine the association between knowledge and risk factors for diabetes among the respondents.

**Results:** Of the 274 respondents, the majority (31.0%) were between 40-49 years with a mean age of 38. The majority of respondents (78.5%) had poor knowledge of diabetes, and as many as 71.2% had poor knowledge of risk factors associated with diabetes. Furthermore, knowledge of diabetes was significantly associated with knowledge of the risk factors associated with diabetes.

**Conclusion:** Knowledge of diabetes among market women in Orisunbare Osogbo, Osun State, is generally poor. Therefore, this study recommends more health education and intervention among market women in Orisunbare Osogbo, Osun State.

**Keywords:** Diabetes, knowledge, lifestyle, market women, risk factors

## Introduction

Globally, diabetes is a public health problem, as it is one of the most common non-communicable diseases that serves as a risk factor for other non-communicable diseases such as kidney failure, heart disease, and stroke. Diabetes is a chronic and severe illness that can slowly kill individuals when left untreated. Everyone is susceptible to this disease because it affects both the elderly and the young. Hence, it is a major contributing factor to high morbidity rates, leading to increased

health costs for individual patients, families, and countries (Asiimwe *et al.*, 2020). Diabetes is characterized by elevated blood sugar levels, caused by either a deficit in insulin secretion or the inability of insulin-sensitivity tissues to respond to insulin. Diabetes is mainly classified into three types: type 1, type 2, and gestational diabetes (Alanazi *et al.*, 2018). Obesity is a major contributing factor to type 2 diabetes as it contributes to a high rate of insulin resistance. Diabetes mellitus (“diabetes”) is a heterogeneous

disorder with many etiological factors. Such factors include genetic factors, demographic factors (e.g., age, gender), and other factors such as lifestyle. These factors contribute to a higher risk of developing this disease. The disease can lead to other complications such as brain, heart, kidney, and liver damage (Adijat *et al.*, 2021).

Diabetes is a life-threatening disease that has become a global threat to public health; hence, it is a fast-growing chronic disease that affects not only diabetic patients but also society at large (Henrik, 2022). The worldwide prevalence of diabetes was estimated to be 9.3% in 2019. The incidence of type 1 diabetes has gradually increased by 2–3%. However, the global diabetes pandemic is a result of type 2 diabetes (Henrik, 2022). Tella *et al.* (2021) account that above 80% of deaths and diseases which occurred in low and middle-income countries were because of diabetes and Nigeria has the highest burden of this disease in Africa with about 1.7 million individuals living with type 2. Hence, this count is likely to increase to 4.8 million by 2030.

Diabetes is more prevalent in developing countries than in developed countries because of poverty; hence, rural areas tend to suffer the most. A sedentary lifestyle, which increases the chances of obesity, unhealthy diets, and even an aging population, contributes to the increased rate of diabetes. Its increased rate can also be attributed to poor infrastructure for diabetic screening, inadequate knowledge, and public awareness of diabetics and their risk factors that lead

to failure of early diagnosis, thereby contributing to the global increase in diabetes (Olokoba *et al.*, 2012).

Many studies on diabetes and its prevalence have been conducted. Shittu *et al.* (2017) reported that the prevalence rate of diabetes in Nigeria varies from 0.65% to 11.0%. Furthermore, the overall prevalence of diabetes in southeastern Nigeria is 10.51%. In contrast, in southwestern Nigeria, the prevalence of diabetes ranges from 4.76% in Ile-Ife Osun State to 11.0% in Lagos, Nigeria. The National prevalence of diabetes in Nigeria is 2.2% (Shittu *et al.*, 2017). According to Adijat *et al.* (2021), the prevalence of diabetes mellitus among adults aged 20 – 69 years in Nigeria is 1.7%. Due to poverty and inadequate access to healthcare, many cases are yet to be diagnosed in Nigeria (Adijat *et al.*, 2021).

Market women are primarily traders who sell agricultural products, food, and other items in the market, where they spend long hours in work and physical labor. Thus, their health is most often affected significantly as they are exposed to stress in the effort to make ends meet, because most of them are the primary breadwinners of their families, spending up to 15 hours a day in the market (Olagunju *et al.*, 2016). It is noted that the greatest percentage of people in the market who stay from dusk to dawn are women. As a result of spending hours in the market, they engage in lifestyles such as dietary habits where they consume meals rich in fats and sugar while sitting down most of the time without physical

activities such as exercise, which can negatively affect their health (Agwo *et al.*, 2019). Owing to globalization and industrialization, people tend to use more high-sugar foods and engage in sedentary work with changing lifestyles (Liyanage, 2018). Knowledge plays a vital role in disease prevention and management as it helps fight diseases and their complications, as well as both socioeconomic and medical consequences (Shiferaw *et al.*, 2020). Knowledge is a valuable tool for improving compliance with medical therapy (Sami *et al.*, 2017).

Market women are acquainted with a sedentary lifestyle and unhealthy diets as the environment they find themselves in demand, making them vulnerable to the risk of developing diabetes (Agwo *et al.*, 2019). With globalization and industrialization contributing to highly sedentary lifestyles and unhealthy diets, Orisunbare being a semi-urban area is bent towards globalization and industrialization, which has contributed to the lifestyles and eating habits of the market women. (Liyanage, 2018). Therefore, to improve quality of life and reduce the high rate of morbidity and mortality among people with diabetes mellitus, this study examined the level of knowledge of diabetes risk factors among market women in Orisunbare Osogbo, Osun State, Nigeria.

## Methodology

### Study Design

A descriptive quantitative design was adopted, utilizing a cross-sectional survey

conducted between May and July 2022 among 274 market women at Orisunbare Osogbo, Osun State, Nigeria.

### Study Area

This market is located at Latitude 7.7786° or 7° 46' 43" north or Longitude 4.5483° or 4° 32' 54" east in Osogbo, Osun State, Nigeria. Orisunbare is one of the markets in Osogbo. It is a large market in Osogbo, Osun State, Nigeria, where different goods and services are rendered to people. The market houses many young and old people who go about different business transactions.

### Study Participants

Market women at Orisunbare Osogbo, Osun State, Nigeria who consented to participate were included in the study. Since the population is unknown, we used Leslie Kish's formula to determine the sample size.

$$n_0 = \frac{Z^2 Pq}{d^2}$$

Where  $n_0$  = Unknown sample size = ?

$Z^2$  = Z-value (correspondent of the confidence level)  
(95% Z-score = 1.96)

P = Estimated prevalence rate of diabetes which is gotten from previous Studies (21%) = (0.21) according to Uddin *et al.* (2022).

q = (1-P)

d = level of precision or the margin of error ( $\pm 5\%$  = 0.05)

Substituting the values, we have:-

$$\begin{aligned} n_o &= \frac{1.96^2 \times 0.21 \times (1-0.21)}{0.05^2} \\ &= \frac{1.96 \times 1.96 \times 0.21 \times 0.79}{0.05^2} \\ &= \frac{3.8416 \times 0.21 \times 0.79}{0.0025} \\ &= \frac{0.63732144}{0.0025} \\ &= 254.92 \end{aligned}$$

Approximately = 255

Hence, n = 255

Therefore, for the non-respondent rate of misplaced and unattained questionnaires, 10% of n was added.

$$\begin{aligned} \text{Non - respondent rate} &= (10\% \text{ of } n) \\ &= 10/100 \times 255 \\ &= 0.1 \times 255 \\ &= 25.5 \end{aligned}$$

Therefore, adding 13.8 to the calculated sample size

$$\begin{aligned} &= 25.5 + 255 \\ n &= 280.5 \end{aligned}$$

Approximately; = 281

Therefore, a sample size of 281 was used in this study.

## Sampling Technique

Convenience sampling method was used to select the respondents. The respondents were selected based on their availability in their shops, and systematic sampling was used to select the respondents based on intervals until the required sample size was attained. Face-to-face interviews were conducted to obtain the information needed for the questionnaire from those with low reading and writing skills. This was done by interpreting the questionnaire to them in their local dialect and ticking the answers based on their responses.

## Data Collection and Analysis

Information was gathered using a self-designed questionnaire on knowledge of diabetes and its associated risk factors. Statistical analysis was performed using IBM SPSS® (version 23). Frequencies and percentages were used for the descriptive statistics. A Chi-square test was used to assess the statistical significance of knowledge of diabetes and overall risk factors for diabetes. Data were considered statistically significant at  $P < 0.05$ . General knowledge of diabetes and the risk factors associated with diabetes were scored as correct responses (1) and wrong responses zero (0). To determine those with good or poor knowledge, the questions were scaled and scored such that all correct answers were coded as 1 and all wrong answers as 0.

## Ethics Consideration

Ethical clearance was obtained from the ethics committee of Adeleke University,

Ede Osun State, Nigeria. Written and verbal consent were obtained from the respondents before the questionnaires were distributed. The data were secured to ensure confidentiality.

## Results

Analysis and interpretation of data obtained using a structured questionnaire. A total of 281 questionnaires were administered, of which 274 were retrieved and valid for the analysis (97.5 %).

**Table 1**

*Socio-demographic Characteristics*

Variables		Frequency	Percentage (%)
<b>Age</b>	20 - 29years	52	19.0
	30 - 39years	82	29.9
	40 - 49years	85	31.0
	50 & above	55	20.1
<b>Marital status</b>	Single	62	22.6
	Married	191	69.7
	Divorced/ Separated	7	2.6
	Widow	14	5.1
<b>Tribe</b>	Yoruba	169	61.7
	Igbo	20	7.3
	Hausa	7	2.5
	Other	78	28.5
<b>Religion</b>	Christian	92	33.6
	Muslim	170	62.0
	Others	12	4.4
<b>Level of education</b>	Primary	114	41.6
	Secondary	62	22.6
	Tertiary	31	11.3
	Others	67	24.5
<b>Monthly Income</b>	₦21,000 – ₦30,000	163	59.5
	₦31,000 – ₦40,000	85	31.0
	₦41,000 – ₦50,000	26	9.5

Source: Research Data (2022)

Table 1 presents the respondents' demographic characteristics. Regarding age, 31.0% of the respondents were between 40-49 years. The mean age was 38 years. Approximately 69.7% of the respondents were married, and the majority (61.7 %) were Yoruba. More than half of the respondents (62.0%) were Muslim. On the educational level, the majority of the respondents (41.6%) had a primary education, and 59.5% earned ₦21,000 - ₦30,000 monthly.

**Table 2***Respondents on Knowledge on Diabetes*

S/N	Variables	Yes (%)	Not Sure (%)	No (%)
1	Diabetes is a chronic disease characterized by insufficient or deficiency of insulin.	52 (19.0)	196 (71.5)	26 (9.5)
2	Diabetes is a condition known for high sugar in the blood.	26 (9.5)	0 (0.00)	248 (90.5)
3	Diabetes can affect any part of the body.	52 (19.0)	140 (51.1)	82 (29.4)
4	Diabetic patients need insulin for their survival especially type 1 diabetes.	78 (28.5)	56 (20.1)	140 (51.1)
5	A woman can develop diabetes when she is pregnant	78 (28.5)	55 (20.1)	141 (51.5)
6	Frequent urination, sudden weight loss, abnormal thirst and dry mouth, and high sugar levels are signs and symptoms of diabetes.	107 (39.1)	167 (60.9)	0 (0.00)
7	Blurred vision, fatigue, slow healing of wounds, bed wetting are also signs and symptoms of diabetes.	52 (19.0)	108 (39.4)	114 (41.6)
8	Diabetes can be transferred through hereditary (genes)	52 (19.0)	107 (39.0)	115 (42.0)
9	Family history is one of the risk factors for diabetes.	108 (39.4)	107 (39.1)	59 (21.5)
10	Consuming too much of carbohydrates and sweets is a risk factor for diabetes.	104 (38.0)	170 (62.0)	0 (0.00)
11	Obesity, unhealthy diets, and physical inactivity can contribute to the risk of developing diabetes.	26 (9.5)	56 (20.4)	192 (70.1)
12	Diabetes can cause damage to the eyes, kidneys, brain diseases such as stroke, and also cause diabetic foot ulcers.	0 (0.00)	167 (60.9)	107 (39.1)
13	Modifying lifestyle such as eating habits, physical activity can help to reduce the risk of diabetes.	26 (9.5)	26 (9.5)	225 (81.0)
14	Regular exercise can help to prevent diabetes.	78 (28.5)	55 (20.0)	141 (51.5)
15	Diabetes is incurable but can be prevented.	78 (28.5)	55 (20.0)	141 (51.5)

Table 2 presents the frequency distribution of the respondents based on their knowledge of diabetes. Results revealed that more than half of the respondents (71.5%) were unsure whether diabetes is a chronic disease characterized by insufficient or deficient insulin. Similarly, a higher percentage (90.5%) reported that diabetes is not a condition known for high sugar levels in the blood. Moreover, more than half (51.1%) of the study participants were unsure whether diabetes could affect any part of the body. In addition, the respondents (51.1%) indicated that patients with diabetes,

especially type 1 diabetes, do not need insulin, and no woman could develop diabetes during pregnancy.

Table 2 also shows that 60.9% of the respondents were unsure if frequent urination, sudden weight loss, abnormal thirst, dry mouth, and high sugar levels are signs and symptoms of diabetes. 41.6% declined that blurred vision, fatigue, slow wound healing, and bed wetting are also signs and symptoms of diabetes.

A significant number of the respondents thought that diabetes could not be transferred through hereditary/genes (42.0%), and family history was one of

the risk factors for diabetes (39.4%). Moreover, the majority (62.0 %) said they were unsure if consuming too many carbohydrates and sweets could be a risk factor for diabetes. As many as 70.1% reported that obesity, unhealthy diets, and physical inactivity cannot contribute to the risk of developing diabetes. 60.7% reported that they were unsure if diabetes could cause damage to the eyes, kidneys, diabetic foot ulcers, or brain diseases such as stroke. The results also revealed that

the majority (81.0 %) said that modifying lifestyle, such as eating habits and physical activity, cannot help reduce the risk of diabetes. Similarly, 51.5% of participants indicated that regular exercise could not help prevent diabetes. Some respondents (51.5% ) shared that diabetes is incurable but cannot be prevented. Figure 1 shows the overall knowledge of diabetes. The results showed that the majority (78.5%) of respondents had poor knowledge of diabetes.

**Figure 1**

*Overall Knowledge of Diabetes*

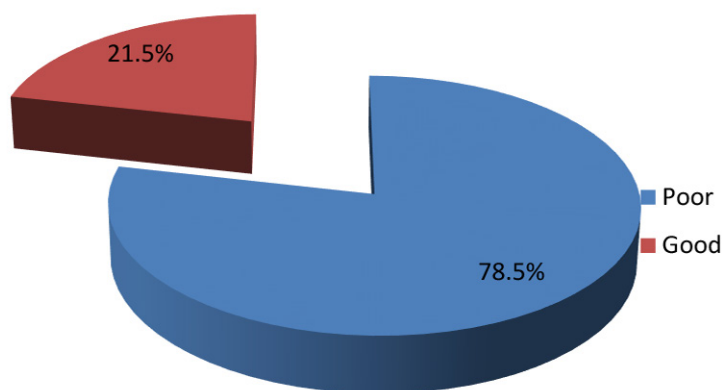


Table 3 presents the frequency distribution of the respondents according to their knowledge of diabetes risk factors. The results revealed that the majority (51.5%) were unsure if obesity (fatness) was a major contributing factor to the risk of developing diabetes. Similarly, 51.4% of the respondents reported that having an overweight baby could not cause gestational diabetes. Only 9.5% of the respondents said that diabetes could be inherited from mothers, fathers,

siblings, or even external families such as grandparents, uncles, and aunts.

Moreover, the respondents said that family history did not contribute to the risk of developing diabetes (60.6%). The respondents were unsure if a lack of exercise could lead to obesity (60.6%) or if a sedentary lifestyle or smoking could contribute to the risk of developing diabetes (70.1%).

**Table 3***Knowledge of Risk Factors Associated with Diabetes*

S/N	Variables	Yes (%)	Not Sure (%)	No (%)
1	Obesity (fatness) is a major contributing factor to the risk of developing diabetes.	52 (19.0)	141 (51.5)	81 (29.5)
2	Having an overweight baby can cause gestational diabetes.	26 (9.5)	107 (39.1)	141 (51.4)
3	Diabetes can be inherited from mothers, fathers, siblings even external families like grandparents, uncles, aunts, etc.	26 (9.5)	138 (50.4)	110 (40.1)
4	Family history can contribute to the risk of developing diabetes.	26 (9.5)	82 (29.9)	166 (60.6)
5	Not exercising can contribute to the increase of body fats which can lead to obesity.	52 (19.0)	166 (60.6)	56 (20.4)
6	(Sedentary) Lifestyles such as sitting at a place for long, frequent use of a motorcycle, less exercise can contribute to the risk of developing diabetes	52 (19.0)	192 (70.1)	30 (10.9)
7	Smoking of tobacco products such as cigarettes is a risk factor.	26 (9.5)	192 (70.1)	56 (20.4)
8	Alcohol intake is a contributing factor to the risk of developing diabetes.	52 (19.0)	30 (10.9)	192 (70.1)
9	Older people are more susceptible to developing diabetes	224 (89.1)	30 (10.9)	0 (0.00)
10	Supernatural forces like witches and wizards are the main cause of diabetes.	26 (9.5)	114 (48.9)	134 (41.6)
11	Stress can also contribute to the risk of diabetes.	26 (9.5)	112 (40.9)	136 (49.6)
12	Hypertension is a contributing factor to diabetes as well	82 (29.9)	140 (51.1)	52 (19.0)
13	Poor dietary habits such as high intake of sugar-sweetened foods or beverages e.g., soft drinks, high intake of salt in food, inadequate consumption of fruits and vegetables, and junk foods can cause diabetes	136 (49.6)	82 (29.9)	56 (20.4)
14	Pregnancy can also contribute to risk of developing diabetes.	82 (29.9)	84 (30.7)	108 (39.4)
15	Environmental factors such as exposure to viruses or bacteria can also cause diabetes.	52 (19.0)	56 (20.4)	166 (60.6)

Source: Research Data (2022)

Similarly, 70.1% of respondents were unaware that alcohol intake was a contributing factor to the risk of developing diabetes. Interestingly, the majority (89.1%) of participants reported that old age was a risk factor. However, 48.9% of the respondents were unsure whether supernatural forces, such as witches and wizards, were the main cause of diabetes. In addition, 49.6% of the respondents noted that stress was not a risk factor for diabetes, while 51.1% were

unsure if hypertension was a contributing factor to diabetes.

Moreover, 49.6% of the respondents correctly indicated that poor dietary habits, such as high intake of sugar-sweetened foods or beverages, high salt intake, inadequate consumption of fruits and vegetables, and junk foods, contribute to the risk of developing diabetes. Similarly, 39.4% said that pregnancy does not contribute to the risk of developing diabetes, and 60.6%

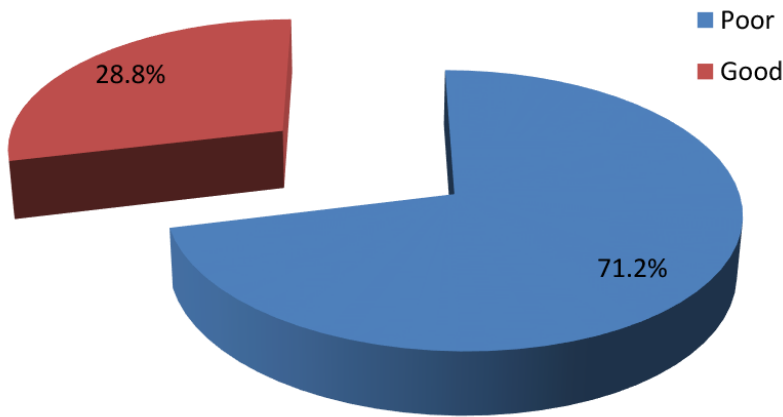


indicated that environmental factors, such as exposure to viruses or bacteria, can pose a risk of developing diabetes.

showed that the majority (71.2%) of the respondents had a low level of knowledge about the risk of diabetes.

Figure 2 summarizes respondents' overall knowledge of the risk factors associated with diabetes. The results

**Figure 2**  
*Overall Knowledge of Risk Factors Associated with Diabetes*



**Table 4**  
*Association between Knowledge of Diabetes and Knowledge of Risk Factors of Diabetes*

	Categories	Knowledge on Diabetes		$\chi^2$	P-value	Decision
		Poor	Good			
Knowledge on risk factors of diabetes	Poor 195 Good 79	215	59	12.094	.011*	sig.

Source: Research Data (2022)

Table 4 presents the association between knowledge of diabetes and its risk factors. The results showed a significant association between knowledge of diabetes and knowledge of diabetes risk factors ( $\chi^2= 12.094^a$ ; p-value= .011). The implication is that

there is a significant relationship between knowledge of diabetes and risk factors for diabetes among market women in Orisunbare Osogbo, Osun State, Nigeria.

## Discussion

The current study found that respondents aged 40–49 years had the highest participation rate (31.0%). This is because the study location had a high percentage of people within that age range at the time the study was conducted. The highest age group in this study is in line with the study by Ola *et al.* (2021) on the knowledge and perception of diabetes mellitus among civil servants in Oyo State, Nigeria. More than half of the respondents (61.7 %) were Yoruba, which could be a result of being a Yoruba-speaking state. This is also in line with the study carried out by Ola *et al.* (2021) on the knowledge and perception of diabetes mellitus among civil servants in Oyo State because Oyo has a high number of Yoruba people living within the state. The majority of the respondents 69.7% being more than half of the respondents were married which could be a result of most of these women being breadwinners and likely to play a supportive role in the family. This corroborates the study of Kifle *et al.* (2022) that 65.9% of the respondents were married, which could be attributed to the population sample and the settings, unlike the study carried out by Ubangha *et al.* (2016), which was conducted among adolescents attending a public school in Lagos.

Furthermore, the educational status (41.6%) of the respondents was poor, which may be due to financial issues and family background, which is in line with a study conducted by Omobuwa and Alebiosu (2022) on awareness of diabetes among undergraduates in a Nigerian

University, Southwest Nigeria, where the educational level of the respondents was poor, which may be a result of unexposure to what diabetes is all about. However, this poor level of education does not correlate with the study by Zowgar *et al.* (2018), in which there is a high level of education.

The results showed that most respondents (78.5%) had poor knowledge of diabetes, as shown in Table 2. A plausible reason for this is the respondents' low educational level. Poor knowledge of diabetes corroborates the conclusion of Zowgar *et al.* (2018) in a study on diabetes knowledge among adult patients with diabetes using a diabetes knowledge test. Meanwhile, the finding disagrees with Mumu *et al.* (2014), who found that the knowledge and attitude levels were 13% good, 68% average, and 19% poor. Furthermore, this study does not corroborate the study of Kifle *et al.* (2022), a study conducted on knowledge of diabetes and its chronic complications and associated factors among patients with diabetes in the University of Gondar Comprehensive Specialized Hospital in Northwest Ethiopia, where good knowledge of diabetes was reported as a result of urbanization and exposure to a high level of education.

From the study, most respondents seemed to lack adequate knowledge of the risk factors for diabetes, as seen in Table 3. A similar was found in Pelullo *et al.* (2019) who found that, 97.3% of the participants had heard about diabetes, however only 16.7% were aware of the risk factors. This implies that most

respondents lack adequate knowledge about lifestyle factors, such as sitting in a place for a longer time, while people patronize them as a risk for diabetes. The most probable reason for this is that most market women have found a routine lifestyle that is probably difficult to change. Therefore, some could even resort to harmful practices, such as the use of substances such as alcohol to prevent them from sleeping while in markets or using alcohol-based herbal mixtures, and when stressed, most do not even perceive it. This finding corroborates that of Mathew et al. (2014), who found that 42.4% perceived high consumption of sugar as an important risk factor for developing diabetes. Only 54.4%, 47.8%, 58.4%, 53.6%, and 45.4% perceived a family history of diabetes, obesity, increasing age, physical inactivity, and stress as risk factors for diabetes.

More findings revealed that the majority of the respondents lacked adequate knowledge of the fact that diabetes could be hereditary. This is evidenced by the results presented in Table 3, where the majority indicated that diabetes cannot be inherited based on family history. Moreover, the majority lack the appropriate knowledge that diabetes could be a complication of other conditions such as hypertension or even the gestation period. However, most subscribe to the old doctrine of knowledge that diabetes is a disease of the elderly.

Furthermore, the findings revealed that most respondents lacked the knowledge that physical activity could contribute to diabetes. The most probable reason

for this is that most respondents did not have adequate knowledge of diabetes. However, Sami *et al.* (2017) established that physical activity helps burn up stored body fats, thereby reducing intra-abdominal fat in the body. Our findings contradict those of Kifle *et al.* (2022), in which there were higher knowledge scores on diabetes and its chronic complications. This could be a result of the high level of knowledge about diabetes, which significantly affected the knowledge regarding its chronic complications.

A significant association was also found between knowledge of diabetes and the risk of diabetes among the respondents. The implication is that overall poor knowledge of diabetes corroborates the high risk of diabetes. This finding confirms that of Ismail *et al.* (2021), who found that the incidence of diabetes was strongly associated with knowledge of diabetes. Therefore, one's level of education has a direct influence on the level of knowledge regarding the risk factors, symptoms, and complications of diabetes. The level of knowledge on diabetes and its risk factors is generally poor. This may contribute to the risk of diabetes among respondents in Orisunbare Osogbo Osun State, Nigeria.

## Conclusion and Recommendations

Diabetes prevention is a major barrier to the prevailing global, continental, and national incidence. Adequate knowledge of diabetes and its risk factors can help increase preventive practices. Most respondents lacked sufficient knowledge of risk factors for diabetes, such as specific lifestyle factors and hereditary

factors; hence, they generally lacked adequate knowledge about diabetes, which contributes to a higher risk of developing diabetes.

Based on these findings, the study recommends that non-governmental organizations on diabetes focus more on educating market women on the basic risk factors of diabetes. In addition, conducting health programs periodically in the marketplace by health practitioners will help disseminate health information. Other researchers and healthcare workers can conduct screening and health assessments within the market premises. These screenings can help identify at-risk individuals and provide an opportunity for personalized counseling on diabetes prevention.

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