

Awareness of Risk Factors for Type-2 Diabetes Mellitus among Undergraduates at a Private University in Nigeria: A Cross-Sectional Survey

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Abstract

Background

Diabetes mellitus (DM) is a chronic condition marked by high blood sugar due to issues with insulin production or function, posing a significant global health challenge. Its prevalence is rapidly increasing, with projections rising from 537 million cases in 2021 to 783 million by 2045, particularly in low- and middle-income countries.

Aim

The study evaluated the level of awareness of predictive factors of type 2 diabetes mellitus (T2DM) among undergraduate students of Achievers University Owo, Ondo State, Nigeria.

Methods

A cross-sectional analytical study involving 318 respondents was conducted using a self-administered Google Form questionnaire. Binary and multiple logistic regression analysis were used for data analysis with a significance level set at $p < 0.05$. Analysis were carried out using SPSS version 28

Results

The study found that 222 (70%) of the respondents have high awareness of predictive factors for the development of T2DM while 96(30%) have low awareness. The study found that age (AOR = 4.883, $P < 0.001$; 95% CI 1.483-2.848), persistent unhealthy diet (AOR = 8.685; 95% CI 1.837-3.285; $P < 0.006$), and heredity (AOR = 6.930; 95% CI 1.294-2.834; $P < 0.001$) are independent predictors of awareness of T2DM.

Conclusion

This study revealed that the participants had a good level of awareness with regard to the predictive factors of T2DM. However, since a significant proportion had a low level of awareness, there is a need for health promotion and educational programs to be run aimed at addressing gaps in knowledge among the undergraduates.

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Introduction

Diabetes mellitus (DM) is a dangerous medical disorder that continues to be a global issue due to its rapid growth and high prevalence of significant but avoidable consequences worldwide.[1] Rapid economic development and urbanization have contributed to an increase in the prevalence of diabetes in many regions of the world. T2DM is recognized as a severe public health concern with a considerable impact on human life and health costs.[2] Diabetes has a substantial negative impact on a person's quality of life and functional abilities, which increases morbidity and early death.[3,4]

Concerns have recently been expressed over the fact that individuals under the age of 60 account for more than one-third of diabetes-related deaths.[4,5] These developments have been attributed to an increase in the consumption of poor diets and sedentary lifestyles, which have raised body mass indices (BMI) and fasting plasma glucose levels.[4,6] People with T2DM, in particular, are more likely to have a higher BMI.[4] When compared to 1990, when T2DM was rated as the eighteenth greatest cause of death, the fact that more than 1 million deaths were linked to this condition in 2017 alone makes it the ninth major cause of mortality.[4]

The T2DM is a metabolic disorder that produces increased levels of glucose in the blood and causes alteration in the secretion and /or action of insulin.[7] It is a group of metabolic changes, which is manifested by inadequate production of insulin by the pancreas or when the body does not efficiently utilize the insulin it produces. [7] Poor management or neglect damage different organs in the body, such as; the heart, eyes, kidneys and blood vessels.[7] Diabetes mellitus is a chronic, degenerative disease that affects a person's life; it is also the secondary cause of death after cardiovascular disease.[8]

It demands constant self-care management, and adequate knowledge for patient and family education to help manage the disease and associated treatments to prevent chronic complications.[1,9] People who are aware of their chances of getting diabetes and have access to timely information can use this information to analyze their risk factors, seek appropriate treatment, and adopt healthy behaviours that can delay the onset of diabetes. Good health-related attitudes and perceptions are based on knowledge, and colleges and postsecondary institutions are some of the finest venues to undertake programs that will raise knowledge and awareness of diseases related to lifestyle choices and preventive measures.[1,10]

Therefore, this study is important as it assessed the level of awareness of undergraduates who are still young on the predictive factors T2DM; so that the areas where there are gaps can be identified and proactive steps can be taken to address them. Although there have been multiple researchers that have paid attention to diabetes mellitus, with most studies on T2DM among undergraduates centring on knowledge, attitude and perception, there is little or limited evidence analyzing awareness of predictive factors that are associated with the development of T2DM among undergraduates. The study therefore assessed the level of awareness of undergraduates on the predictive factors of T2DM that influence its development in the course of human lives at Achievers University Owo, Ondo State.

Methods

Study design and settings

The study adopted a cross-sectional descriptive correlational study design. The research was done at Achievers University (AUO), Owo, Achievers University is one of the fast-growing private University which is located in Owo Local Government Area of Ondo State, Nigeria. Achievers commenced operations on 2nd April 2008. The University runs a collegiate system comprising 5

colleges and 2 faculties; College of Basic Health Science, College of Engineering & Technology, College of Law: College of Natural & Applied Science, College of Social and Management Science, College of Medicines, Faculty of Pharmacy, Faculty of Nursing Sciences, Faculty of Medical Laboratory Sciences.

Study population, sample size determination and Sampling technique

The study population comprised all the undergraduate students in halls of residence from a population spread across five colleges and two faculties at Achievers University Owo, which was 2700. The sample size was calculated using the Taro Yamane formula of 1967,[25] to obtain 348 respondents as shown below:

$$n = \frac{N}{1 + N(e)^2}$$

n: Sample size

N: Population size

e: Margin of error (usually expressed as a decimal, e.g., 0.05 for 5%)

$$n = \frac{2700}{1 + 2700(0.05)^2}$$

$$n = \frac{2700}{1 + 6.75}$$

$$n = \frac{2700}{7.75}$$

$$n = 348$$

$$10\% \text{ attrition rate } 34.8 = 35$$

$$\text{Total sample size } 348 + 35 = 383$$

Simple random sampling was used for selecting study participants from the five colleges and two faculties at Achievers University Owo. The researcher created a comprehensive list of all students within the population, assigning each student a unique identifier, such as a student ID. This list became the sampling frame, from which the participants were chosen. The selection of participants was carried out using a random number generator to select 318 unique numbers that corresponded to the identifiers in the sampling frame for ensuring that each student had an equal chance of being selected, thus maintaining the principles of simple random sampling. Therefore the selected participants were contacted via email. They were provided with details about the study and invited to participate.

Inclusion Criteria

The inclusion criteria for the study was the undergraduate students who were currently enrolled full-time at the institution and residing in the halls during the study period, specifically targeting those within the age range of 15 to 30 to encompass traditional undergraduate demographics.

Exclusion Criteria

The study's exclusion criteria specified that participants included non-resident students, such as commuters and those living in off-campus housing, who were not residing in the designated halls of residence. Furthermore, undergraduate students enrolled in part-time programs, certificate courses, or visiting student programs were also excluded from participation.

Instrument for Data collection

Data were gathered using a researcher-developed Google form questionnaire that was divided into two sections. Section A was used to collect the respondents' socio-demographic variables; Section B was used to determine the respondents' level of awareness on the predictive factors that influence the development of T2DM with a list of items that had 'Yes' and 'No' responses. The second section was used to gather data on the overall level of awareness of the predictive factors for the development of T2DM and how much each predictive factor influenced the development of T2DM.

Validity and Reliability of the Instrument

The instrument was validated using face and content validity by experts in the field of fields of Nursing, Public Health and Diabetes. Reliability of the instrument was ensured by using split half reliability test for internal consistency. This was achieved by administering 32 copies (10% of the sample) of the instrument to respondents who were not part of the population but shared similar characteristics with the population. Data obtained were analyzed and the Cronbach Alpha coefficients of 0.84, and 0.77 were obtained for sections B and C respectively, which showed that the instrument was reliable enough for the study.

Data collection

Data was collected using the Google form (questionnaire). After providing their consent to engage in the study, participants were fully informed about the nature of the items, the objective of the investigation, and how to answer them. Prior to the participants providing their answers, they were instructed on how to complete the Google Form questionnaire. The link to the form was distributed to all participants over WhatsApp. A total of 318 students responded and data was collated over three days. After completion of data collection, they were extracted from Google Drive in Microsoft Excel and were coded into.

Method of analysis

Analysis was initially done using descriptive statistics whereby the data were expressed as mean, frequency and percentage in tables.

Subsequently, multiple logistic regression analysis was performed to determine independent predictors of awareness for data analysis. P value was set at $p < 0.05$ level of significance. Statistical Package for the Social Sciences software (SPSS) Version 28.0 was for the analysis.

Ethical consideration

The study was conducted after Ethical clearance with reference number 1206/2023 was obtained from Achievers University's Ethical and Research Committee. Respondents were also assured that whatever information was obtained through the research process would be anonymized, kept confidential and only used for the research.

Results

Socio-Demographic Characteristic of respondents

Table 1. Socio-Demographic Variables (N=318)

Demographic Variable	Options	Frequency	Percentage (%)
Age (Years)	10-14	0	0.0
	15-19	135	42.5
	20-25	137	43.1
	26-30	44	13.8
	Total	318	100.0
Gender	Mean 20 (SD=3.33)		
	Female	229	72.0
	Male	89	28.0
	Total	318	100.0
Ethnicity	Hausa	6	1.9
	Igbo	18	5.7
	Yoruba	257	80.8
	Others*	37	11.6
	Total	318	100.0
Marital status	Married	12	3.8
	Single	306	96.2
	Total	318	100.0
Religion	Christianity	290	91.2
	Islam	28	8.8
	Total	318	100.0
Level of Education	100 level	57	17.9
	200 level	56	17.6
	300 level	47	14.8
	400 level	49	15.4
	500 level	109	34.3
	Total	318	100.0

*others: ethnicity not part of the three major ethnic group in Nigeria

Of the 383 questionnaires administered, 348 were returned, resulting in a response rate of 91%. However, after sorting and cleaning the collected data, 32 of the returned questionnaires were found to be incomplete and unsuitable for analysis. Consequently, a total of 316 questionnaires were used for the final analysis. The findings show that out of the 318 respondents who participated in the study, less than half 137(43.1%) were between ages 20 and 25 years, this was followed by those who were between ages 15 and 19 years 135 (42.5%). The mean age of respondents was 20 (SD=3.33). About two-thirds 229 (72%) of the participants were females while only 89 (28%) were males. Regarding their ethnicity, the majority 257 (80.8%) were Yorubas while the rest 37 (42.5%) were from other tribes; they were neither Igbos nor Hausas. The majority 306 (96.2%) were single and 290 (91.2%) practiced Christianity. (Table 1)

Awareness of predictive factors influencing development of T2DM among respondents Findings showed the level of awareness of the various factors that influence the development of T2DM as identified by respondents. Intake of unhealthy foods 267 (84%) was mostly identified by respondents, it was followed by obesity, excessive alcohol intake and impaired glucose tolerance each of which was identified by 254 (80%). However, excessive stress was identified by the least number 194 (61%) among other predictive factors for developing T2DM. Summarily 222 (70%) of the respondents were aware of predictive factors for the development of T2DM. (Table 2)

Table 2. Awareness of predictive factors influencing development of T2DM among respondents

Factors	Yes (%)	No (%)
Increasing age	247 (78%)	71(22%)
Obesity	254 (80%)	64 (20%)
Persistent intake of unhealthy diet	267 (84%)	51 (16%)
Heredity	242 (76%)	24 (76%)
Lack of exercise	239 (75%)	79 (25%)
Excessive alcohol intake	254 (80%)	64 (20%)
Smoking	207 (65%)	111 (35%)
Impaired glucose tolerance	254 (80%)	64 (20%)
History of gestational diabetes	247 (78%)	71(22%)
Insulin resistance	247 (78%)	71(22%)
Hypertension	223 (70%)	95(30%)
Lipid profile	214 (67%)	104 (33%)
Hormonal diseases	239 (75%)	79 (25%)
Certain medications e.g statins, anti-seizure drugs, etc.	214 (67%)	104 (33%)
Excessive stress	194 (61%)	124 (39%)
Summary of awareness		
Categories	Frequency	Percentage
Low Awareness	96	30%
High Awareness	222	70%
Total	318	100%

Predictive factors influencing development of T2DM as reported by the participants

The multivariable logistic regression analysis revealed that an increase in age had an OR of 0.094, at P<0.001, persistent intake of an unhealthy diet had an OR of 1.838 at P<0.006 while heredity had an OR of 1.5583 at P<0.001.

Respondents were aware that they influence the development of T2DM so they were statistically significant. Age (AOR of 4.883, P<0.001; 95% CI 1.483-2.848), persistent unhealthy diet (AOR of 8.685; 95% CI 1.837-3.285; P<0.006), and heredity (AOR of 6.930, 95% CI 1.294-2.834 P<0.001) being strong predictors. Persistent unhealthy diet was associated with an eight-fold higher likelihood of developing T2DM (AOR 8.685, 95% CI 1.837-3.285). (Table 3)

Table 3. Multivariable logistic regression analysis on predictive factors influencing development of T2DM as reported by the participants

Predictive Factors	COR	AOR (95%CI)	P-values
Increasing Age	0.094	4.883 (1.483-2.848)	0.001
Obesity	0.040	1.001 (0.094-1.239)	3.502
Persistent intake of Unhealthy Diet	1.838	8.685 (1.837-3.285)	0.006
Heredity	1.583	6.930 (1.294-2.834)	0.001
Lack of Exercise	3.838	1.010 (0.049-0.849)	1.033
Excessive Alcohol Intake	0.494	0.059 (0.473-1.743)	2.021
Smoking	1.482	1.345 (0.118-0.572)	1.003
Impaired Glucose Intolerance	0.101	2.066 (0.382-1.732)	1.003
History of Gestational Diabetes	1.992	1.245 (-0.372-0.682)	3.050
Insulin Resistance	1.500	2.707 (0.394-0.889)	2.002
Excessive Stress	0.232	0.985 (0.377-0.612)	1.001
Lipid profile	1.004	1.592 (0.220-1.943)	3.736
Hypertension	0.905	1.623 (0.343-1.654)	2.823
Hormonal Diseases	3.838	1.010 (0.049-0.849)	1.033
Certain Medications	1.004	1.592 (0.220-1.943)	3.736

Discussion

The study aimed to assess the level of awareness among undergraduates at Achievers University, Owo, Ondo State, regarding predictive factors that influence the development of T2DM throughout life. The respondents in this study had a mean age of 20 (SD = 3.33) years, closely aligning with findings from similar studies, which reported mean ages of 20.6 and 21.2, respectively.[11,12] However, this result contrasts with a different study that observed a higher mean age of 26.91 (SD = 6.57).[13] Additionally, the predominance of female respondents in this study reflects

trends commonly seen in healthcare and social science research, where women are generally more inclined to participate in research activities. This gender trend is consistent with findings from prior studies. [11,12,13,14]

The majority of them, based on their marital status, were single because they were still dependent on their parents and guardians for financial support as young adults. This is consistent with the results of a related study conducted in Ondo state.[13] In a similar study most of them were Christians and of the Yoruba tribe because the study was conducted in an institution located in Yoruba-dominated town in Ondo State.[13]

Awareness and knowledge inform the development of correct skills which are important in the management and prevention of T2DM.[11] It also serves as a foundation for the adoption of wise decisions and behaviours linked to health. Some of the finest locations to undertake programs that will raise knowledge and awareness about diseases related to lifestyle choices are faculties and colleges.[14]

The level of awareness 222 (70%) shows that more than two-thirds of the respondents were aware of predictive factors for developing T2DM. A descriptive analysis of the predictive factors shows in Table 2 that the majority of them were aware of the predictive factors that can lead to the development of T2DM. More than two-thirds responded 'Yes' to the factors, implying that a good number were aware of many of the predictive factors of T2DM. This is not in agreement with the finding of a previous study which was done on risk perception and its predictors towards T2DM among students in University Kebangsaan, Malaysia.[15]

According to a study in Thailand, exercise increases the body's energy expenditure and enhances lung function.[16] Likewise it significantly impacts metabolic parameters, including triglycerides, fasting blood sugar levels, waist circumference, and systolic blood pressure in males, while also reducing cardiovascular risk in individuals with T2DM).[12] The multivariable logistic regression analysis of predictive factors for developing T2DM revealed a crude odds ratio (COR) of 3.838 and an adjusted odds ratio (AOR) of 1.010 (95% CI: 0.049–0.849), indicating that respondents understood that insufficient exercise increases the risk of developing T2DM by nearly threefold. This finding aligns with a study in Ghana,[11] and supports conclusions from research in Nigeria, which highlighted barriers to managing T2DM in a review titled "I Must Eat What I Want: A Roadblock to T2DM Management." [17]

Moreover, hormonal disorders had the same AOR (1.010) as exercise. The adjusted odds ratio (AOR) of 1.010 implies that hormonal disorders are slightly associated with DM, but the magnitude of this relationship is minimal. While suggesting that exercise could be a protective factor against the development of DM. It means exercise may lower the odds of developing DM significantly. This is consistent with the review submission on DM Related to Endocrine Disorders: A Comprehensive Update on Diagnosis and Treatment Specifics. Cushing's syndrome, acromegaly, pheochromocytoma, Basedow-Graves disease, glucagonoma, and somatostatinoma are a few of these endocrine disorders.[18,19]

The review highlights several specific endocrine disorders linked to DM: Cushing's Syndrome: Overproduction of cortisol can lead to insulin resistance and glucose metabolism issues, Acromegaly: Excess growth hormone causes insulin resistance, Pheochromocytoma: High levels of catecholamines can disrupt glucose regulation., Basedow-Graves Disease: Hyperthyroidism can impact glucose metabolism, Glucagonoma: Excess glucagon production leads to hyperglycemia, and Somatostatinoma: Inhibits insulin secretion, contributing to DM. These findings suggest the importance of monitoring and managing endocrine disorders to mitigate their impact on diabetes development. The protective effect of exercise further underscores its role as a preventive and therapeutic measure in managing DM.

Furthermore, a history of gestational DM had an AOR of 1.245 (-0.372-0.682), these figures show that respondents were aware that this predictive factor is almost two times more likely to influence the development of T2DM. This is strong with the study on progression from gestational diabetes to T2DM in one region of Scotland in an observational follow-up study in which it was found out that around 25% of women who were diagnosed with gestational diabetes developed T2DM within 8 years

of being diagnosed of gestational diagnosis during their active child-bearing years.[20] Also, the findings showed that the women who had gestational DM after 6-15 years of having gestational DM confirmed that gestational DM is a predictive factor for developing T2DM2.[21] Likewise, persistent intake of unhealthy diet with COR of 1.838 and AOR of 8.685 (1.837-3.285) shows that respondents were aware that this predictive factor is almost two times more likely to influence the development of T2DM as well. This is related to the findings of the following previous studies in which it was reported that intake of an unhealthy diet is an important predictive factor in the development of T2DM.[13,14,15]

Furthermore, heredity had COR of 1.583 and AOR of 6.930 (1.294-2.834), showing that respondents were aware that this predictive factor is almost two times more likely to influence the development of T2DM. This finding supports the view that heredity is a significant factor in the development of T2DM, as reported in previous studies. [11,13,22] However, it contrasts with the findings of another study, which reported that having a family history of diabetes does not increase an individual's risk of developing the disease.[14] The analysis shows that insulin resistance had a crude odds ratio (COR) of 1.500 and an adjusted odds ratio (AOR) of 2.707 (95% CI: 0.394–0.889), indicating that respondents recognized this predictive factor as nearly twice as likely to contribute to the development of T2DM. This finding aligns with previous studies of Lugner et al, on Identifying the top ten predictors of T2DM through machine learning analysis of UK Biobank data, Moreno et al, study on Predictive risk model for the diagnosis of T2DM in a follow-up study 15 years on PRODI2 Study, and Goldfine et al, study on insulin resistance is a poor predictor of T2DM in individuals with no family history of the disease.[22,23,24] Similarly, smoking had a COR of 1.482 and an AOR of 1.345 (95% CI: 0.118–0.572), suggesting that respondents understood smoking as

a factor that increases the likelihood of developing T2DM by over one-fold. This result is consistent with findings from Mohd et al, study which identified smoking as a significant risk factor for T2DM.[15]

These findings underscore the importance of primary prevention of T2DM which should be taken seriously by health workers, especially community/public health nurses help to correct fundamental nutritional and lifestyle problems at the early stages of young individuals' lives. Adequate awareness and knowledge at all levels will have positive effects on the perception of the populace by allowing them to be able to identify the predictive factors of T2DM which will help them to engage in healthy lifestyles and take adequate measures to prevent and control T2DM. Inter-sectoral collaborations can be used to improve awareness and knowledge thereby preventing T2DM. For instance, the university management can collaborate with health professionals especially nurses to create awareness in higher learning institutions through health education so that future generations can be aware of all they should do to keep T2DM at bay. Additionally crucial are early detection, diagnosis, and the start of efficient therapy that will stop T2DM-related problems and impairments. There must be awareness-raising campaigns. Additionally, behavioural change communication materials can be employed; they should include messages specifically crafted to account for the population's sociodemographic features.

Conclusion

This study revealed that the participants have a good level of awareness with regard to the predictive factors of T2DM. However, since a significant proportion are not aware, there is a need for health promotion and educational programs aimed at addressing gaps in knowledge and misconceptions relating to the predictors of T2DM among young people. Intervention policies for lifestyle modifications to factors that could result in the development of T2DM,

which will involve various stakeholders including the general population and nurses, should be put in place by the government. Through this, demographic and socio-economic disparities that hinder regular intake of healthy diet and physical activities can be modified.

Limitations of the study

Self-Reported Data: The use of a self-structured questionnaire via Google Forms may introduce self-reporting bias, as respondents might not accurately recall or disclose their behaviours and awareness levels, impacting the reliability of the findings.

Limited Generalizability: The study was conducted at a single university, which may limit the generalizability of the results to a broader population of young adults or students in different regions or countries.

Internet Access and Digital Literacy: The reliance on an online survey may have excluded students with limited internet access or digital literacy, potentially leading to a sampling bias and underrepresentation of certain subgroups.

Strength of the study

Relevant Population: The focus on undergraduate students provides valuable insights into the awareness of T2DM predictors among young adults, a demographic that is often at risk for lifestyle-related diseases.

Adequate Sample Size: With a sample size of 318 respondents, the study is sufficiently powered to detect significant associations between awareness and predictive factors of T2DM, enhancing the reliability of the findings.

Descriptive Correlational Design: The use of a cross-sectional descriptive correlational survey design allows for the exploration of relationships between variables, providing a comprehensive overview of awareness levels among participants.

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Competing Interests

The authors have no conflict of interest.

Author contributions

OOA designed the study, and prepared the manuscript. TAE retrieved and analyzed the data and edited the manuscript.

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