

Socioeconomic Factors and Risk for Developing Type 2 Diabetes Mellitus: A Cross-Sectional Study among Healthcare Workers at a Tertiary Hospital in Ile-Ife, Nigeria

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ABSTRACT

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Background: The global burden of type 2 diabetes mellitus (T2DM) is increasing, particularly among healthcare workers, who are at risk due to socioeconomic factors and lifestyle choices. Understanding the associations between these factors and the risk of developing T2DM is crucial for targeted prevention strategies. This study investigated the associations between socioeconomic variables and the risk of developing T2DM among healthcare workers at Obafemi Awolowo University Teaching Hospital, Ile-Ife, using the Finnish Diabetes Risk Score (FINDRISC).

Methods: A descriptive cross-sectional study was conducted among 391 healthcare workers who completed a self-administered questionnaire on their sociodemographic and socioeconomic characteristics and diabetic risk. The FINDRISC tool was used to calculate the 10-year risk of developing T2DM. The data were analysed via descriptive and inferential statistics.

Results: A total of 391 healthcare workers completed the study. The mean age (SD) of the participants was 40.7 (8.2) years. There were 260 (66.5%) females and 327 (83.6%) married individuals. 218, 55.7% had tertiary education, 161, 41.2% were nurses, 172, 44% of the respondents earned between N201,000- N605,000, and the upper class represented 218, 55.8%. In terms of diabetes risk, 55.5% were classified as low risk, 24.8% as slightly elevated risk, and 8.2% as high risk for developing T2DM. The determinants of diabetic risk among healthcare workers include being female (OR = 4.81, 95% CI: 2.4 -9.40, $p = 0.001$), being ever married (OR = 8.40, 95% CI: 2.22-31.79, $p = 0.002$), having postgraduate education (OR = 2.98, 95% CI: 1.60-5.60, $p = 0.001$), being in a nursing profession (OR = 2.08, 95% CI: 1.11-3.84, $p = 0.023$), and having a higher monthly income (OR = 2.11, 95% CI: 1.00-4.45, $p = 0.050$).

Conclusion: Increased socioeconomic class is associated with increased risk of developing T2DM among healthcare workers. There is a need for targeted prevention programs focusing on lifestyle modifications and regular screening, particularly for high-risk groups within the healthcare sector.

Keywords: Type 2 diabetes mellitus, Socioeconomic status, Healthcare workers, diabetic risk, FINDRISC.

INTRODUCTION

Noncommunicable diseases such as cardiovascular diseases and type 2 diabetes account for up to 74% of deaths worldwide. Type 2 diabetes mellitus (T2DM) is a significant and growing global health challenge with a significant impact on individuals, families, and healthcare systems. The incidence of type 2 diabetes mellitus is increasing in sub-Saharan Africa, where people now consume foods high in saturated fats and live a sedentary lifestyle.¹ Its prevalence is rising more rapidly in developing countries where the working age is mostly affected.^{2,3} It is also a source of financial strain due to the high pill burden, cost of investigations and hospital admissions.⁴

Socioeconomic factors, such as income, education, and occupation, influence lifestyle choices and the risk of developing T2DM. High socioeconomic class (SEC), as judged by these factors, has been linked to a higher prevalence of T2DM.⁵ Among healthcare workers who are mostly judged to be in the high/middle SEC and work almost round the clock, adopting a healthy lifestyle may be difficult, putting them at risk of obesity and dyslipidaemia, which are risk factors for developing T2DM.⁶⁻⁸ Healthcare workers, despite their role in promoting health, are not immune to these risks because of factors such as long working hours, stress, and irregular dietary habits. Healthcare workers face unique challenges, such as stress,

poor dietary habits, and sedentary lifestyles, that may increase their risk of developing T2DM. If these risk factors are detected earlier during screening, T2DM can be prevented by instituting effective and consistent lifestyle modifications.

Preventing T2DM can significantly reduce the need for many years of drug therapy and complications; thus, screening individuals at risk is recommended.^{9,10} However, true primary prevention would be to identify high-risk subjects when they are still in a normoglycemic state and to treat them with interventions that prevent their transition from normoglycemia to impaired glucose tolerance and overt diabetes. Some available screening tools include the American Diabetes Association risk test (ADA),¹¹ the Canadian Diabetes Risk Score (CANRISK),¹² and the Finnish Diabetes risk score (FINDRISC).⁹ The FINDRISC is the most accurate and widely used tool in primary care because it is simple, does not require laboratory data, and can be applied at the population level.⁹ This is because the lack of primary prevention of T2DM has been found to contribute to the morbidity and mortality of the disease.

This study aims to determine the associations between socioeconomic variables and the risk of developing T2DM among healthcare workers at the Obafemi Awolowo University Teaching Hospitals Complex (OAUTHC), Ile-Ife, Nigeria.

METHODS

Obafemi Awolowo University Teaching Hospital (OAUTHC), situated at Ife central LGA, Ile-Ife, Nigeria, is a renowned tertiary healthcare institution that provides medical education, research, and healthcare services. It is a referral centre for primary, secondary, and tertiary care services. The institution is staffed by a dedicated team of highly qualified and experienced healthcare professionals. The staff includes medical consultants, resident doctors, nurses, laboratory scientists, pharmacists, radiographers, and other allied health professionals.

This study employed a descriptive cross-sectional design. The study population included all consenting healthcare workers in the Obafemi Awolowo University Teaching Hospitals Complex, Ile-Ife, Nigeria. Healthcare workers not available during the period of study or pregnant or known diabetic patients were excluded from the study.

Sample size calculation via an appropriate statistical formula for descriptive health studies ($n = Z^2pq/d^2$), and the non-response rate taken into consideration was calculated to 417.^{13,14}

A multistage sampling technique was used to select eligible participants. The nominal roll was obtained from the Establishments Department of the hospital. The name, department, designation, and phone number of health workers (nominal roll) used for the selection of respondents. In the first stage, the HCWs were divided into six professional groups on the basis of the categorization by

Ismail et al.,¹⁵ which includes Physicians, Nurses, Pharmacists, Laboratory personnel (which include laboratory scientists, technologists, radiographers), other healthcare workers (which include physiotherapists, dieticians, and nursing assistants) and management and support staff (which include administrators, accountants, engineers, architects, ambulance drivers and health records staff).

In the second stage, the number recruited in each professional group was determined proportionately via the formula $n/N \times 417$, where n was the number of staff in an occupational group and N was the total number of healthcare workers in the hospital at the time of the study.

For the third stage, the sampling interval was calculated to be 5. The first participant was selected by simple balloting, while a systematic sampling technique was used to select every 5th name on the list until the required number of study participants was reached. The recruited HCWs were contacted by phone, and for anyone who did not meet the inclusion criteria, the next eligible person on the list was selected until the required number of participants was reached. The first respondent was the first health worker who met the inclusion criteria. This same process was repeated for each professional group.

A structured, pretested, self-administered questionnaire derived from a review of the relevant literature was given to the respondents. It elicited information on sociodemographic characteristics, socioeconomic variables and Finnish diabetes risk scores. Socioeconomic status (SES) was assessed using the revised socioeconomic classification proposed by Ibadin and Akpede (2021).¹⁶ The classification incorporates educational attainment, occupation, and income, with each domain assigned a score from 1 to 6, where lower scores indicate higher socioeconomic position. The mean of the three domain scores was used to determine the overall SES, which was categorized as upper (1–2), middle (3–4), or lower (5–6) socioeconomic class.

The Finnish Diabetes Risk Score (FINDRISC) was used to estimate the 10-year risk of developing type 2 diabetes mellitus. It is a simple, non-invasive, laboratory-free risk assessment tool incorporating age, body mass index, waist circumference, use of antihypertensive medication, history of elevated blood glucose, physical activity, fruit and vegetable intake, and family history of diabetes.¹⁷ The tool has been applied in Nigerian populations,^{18,19} including young adults in southern Nigeria and rural communities, demonstrating its feasibility and applicability in the Nigerian setting. However, evidence for formal validation or recalibration specifically for the Nigerian population remains limited; therefore, in this study, the FINDRISC scoring system and risk categories was recategorized to low risk (<7) and above low risk (≥ 7) for ease of analysis. For ease of analysis, the married and widowed individuals were grouped as ever married, the occupational groups and duration of service were also reclassified.

It was pretested by a senior researcher to ensure that the

item wordings were understandable and appropriate for the range of occupations within the local context, to identify possible challenges that may be encountered during the study, to incorporate any useful feedback from the study participants, and to estimate the time required for completion of the questionnaire and corrected thereafter. The face validity was the ability of the authors to ensure that the questions asked met set objectives.

Ethical approval for the study was obtained from the OAUTHC Ethics and Research Committee with protocol number ERC/2021/06/23. Written informed consent was obtained from each respondent before the questionnaire was administered. The confidentiality of the collected data was maintained throughout the study, as only the investigators stored data generated from the research. The data were entered and analysed via SPSS version 25. Simple descriptive and inferential statistics were performed, and the results are presented in tables. A bivariate logistic regression model was used to examine the relationships between diabetic risk (main outcome variable) and sociodemographic and socioeconomic variables (explanatory variables). The results are expressed as odds ratios (ORs) and 95% confidence intervals (CIs). Tests were considered significant when the p value was <0.05.

RESULT

A total of 391 out of 417 HCWs completed the study giving a response rate of 93.8%. The mean age (SD) was 40.7 (8.2) years, ranging from 25 years to 59 years. There were 131 (33.5%) males and 260 (66.5%) females. Most respondents were married (327, 83.6%), and 269 (68.8%) had been employed for less than 10 years. (Table 1).

Table 1: Sociodemographic characteristics of the respondents. N=391

Variables	Frequency (n)	Percentage (%)
Age (Years)		
25-34	90	23.0
35-44	180	46.0
45-54	91	23.3
55-59	30	7.7
Sex		
Female	260	66.5
Male	131	33.5
Marital Status		
Single	57	14.6
Married	327	83.6
Widowed	7	1.8
Duration of service (years)		
1-10	269	68.8
11-20	62	15.9
21-35	60	15.3

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Most respondents (218, 55.7%) had tertiary education, and nursing was the most predominant occupation (161, 41.2%), while 173 (44%) of the healthcare workers earned more than N200,000. More than half of the respondents

(218, 55.8%) belonged to the upper socioeconomic class. (Table 2)

Table 2: Socioeconomic characteristics of the respondents. N=391

Variables	Frequency (n)	Percentage (%)
Educational Qualification		
Secondary	39	9.9
Tertiary	218	55.7
Postgraduate	134	34.4
Professional Class		
Nurse	161	41.2
Medical Doctor	54	13.8
Laboratory and Radiography Personnel	33	8.4
Pharmacist	15	3.8
Administrators	42	10.7
Health Assistants	25	6.4
Clerical Staff	22	5.6
Physiotherapist	11	2.8
Dieticians	10	2.6
Cleaners	9	2.3
Security Personnel	4	1.1
Health Information Managers	3	0.8
Gardeners	2	0.5
Income (in naira)		
35,000-100,000	87	22.2
101,000-200,000	132	33.8
201,000-605,000	172	44.0
Socioeconomic class		
Lower	62	15.8
Middle	111	28.4
Upper	218	55.8

Figure 1 provides a visual representation of the calculated 10-year risk for developing type 2 diabetes mellitus (T2DM) among the surveyed individuals, utilizing the Finnish Diabetes Risk Score (FINDRISC). The data further revealed that 217(55.5%) of individuals had a FINDRISC score less than 7, indicating that they were categorized into the low-risk group. Another segment, constituting 24.8% or 97 respondents, fell into the slightly elevated risk category, with FINDRISC scores ranging from 7 to 11. The figure indicates that for individuals at high risk of developing T2DM, 8.2% or 32 respondents obtained scores within the range of 15-20. Furthermore, only 1.3% of the population, represented by 5 individuals, had a FINDRISC score greater than 20 and were classified into the very high-risk group, indicating a significant differentiation in risk levels among the surveyed individuals.

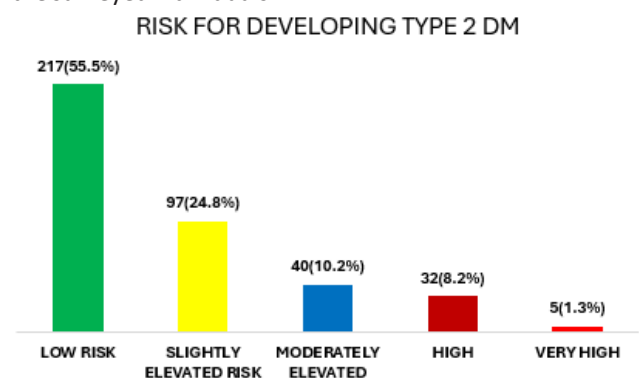


Figure 1: The 10-year risk of developing T2DM among respondents n(%)

Table 3 shows the associations between sociodemographic variables, socioeconomic variables and the risk of diabetes among the respondents. The significant factors associated with the risk of developing T2DM included being female, being married, having long-term employment status, attaining higher educational qualifications, being in the nursing profession, earning higher income and being in a higher socioeconomic class.

Table 3: Association between sociodemographic variables, socioeconomic variables and risk for developing diabetes (N=391)

Socioeconomic variables	Risk for developing diabetes			df	χ^2	p-value
	FINDRISE<7 N=217	FINDRISE≥7 n=174	Total (n%)			
Sex				1	51.53	0.001
Male	106 (80.9%)	25 (19.1%)	131(100%)			
Female	111 (42.7%)	149 (57.3%)	260(100%)			
Marital Status				1	25.08	0.001
Never married	49 (86.0%)	8 (14.0%)	57(100%)			
Ever Married	168(50.3%)	166 (49.7%)	334(100%)			
Duration of service (years)				2	37.10	0.001
1-10	170 (63.2%)	99 (36.8%)	269(100%)			
11-20	35 (56.5%)	27 (43.5%)	62(100%)			
21-35	12 (20%)	48 (80%)	60(100%)			
Educational Status				2	9.66	0.008
Secondary	25 (64.1%)	14(35.9%)	39 (100%)			
Tertiary	132(60.6%)	86(39.4%)	218 (100%)			
Postgraduate	60(44.8%)	74(55.2%)	134 (100%)			
Professional Class				5	27.21	0.001
Nurses	69 (42.9%)	92 (57.1%)	161 (100%)			
Medical Doctors	34 (63.0%)	20 (37.0%)	54 (100%)			
Lab/Radiology personnel	23 (69.7%)	10 (30.3%)	33 (100%)			
Pharmacists	14 (93.3%)	1 (6.7%)	15 (100%)			
Management staff	51(60.2%)	32 (39.8%)	45 (100%)			
Others*	26 (57.8%)	19 (42.2%)	83 (100%)			
Income (in Naira)				2	15.98	0.001
35,000- 100,000	57 (65.5%)	30(34.5%)	87 (100%)			
101,000-200,000	84 (63.6%)	48 (36.4%)	132 (100%)			
201,000-605,000	76 (44.2%)	96(55.8%)	172 (100%)			
Socioeconomic class				2	9.93	0.007
Upper	106(48.6%)	112(51.4%)	218 (100%)			
Middle	69(62.2%)	42(37.8%)	111(100%)			
Lower	42(67.7%)	20(32.3%)	62 (100%)			

Table 4 shows the binary logistic regression analysis of determinants of T2DM risk among respondents. The determinants include being female (OR = 4.81, 95% CI: 2.47-9.40, $p = 0.001$), being married (AOR = 8.40, 95% CI: 2.22-31.79, $p = 0.002$), having postgraduate education (OR = 2.98, 95% CI: 1.60-5.60, $p = 0.001$), being a nurse (OR = 2.08, 95% CI: 1.11--3.84, $p = 0.023$) and earning higher income (OR = 2.11, 95% CI: 1.00-4.45, $p = 0.050$).

Table 4: Binary logistic regression analysis of factors associated with the risk of developing diabetes

Parameters	Std. error	Odds ratio	95% CI	p-value
Sex				
Male (Ref)		1		
Female	0.34	4.81	2.47- 9.40	0.001
Marital Status				
Never Married (Ref)		1		
Ever Married	0.68	8.40	2.22-31.79	0.002
Duration of employment				
1-10years (Ref)		1		
≥10 years	0.30	1.13	0.63-2.04	0.690
Educational Qualification				
Secondary/Tertiary (Ref)		1		
Postgraduate	0.32	2.98	1.60-5.60	0.001
Professional Class				
Nurses (Ref)		1		
* Others	0.32	2.08	1.11-3.84	0.023

Income (in Naira)				
≤100,000 (Ref)		1		
>100,000	0.38	2.11	1.00-4.45	0.050

Discussion:

This study assessed socioeconomic factors and the risk of developing diabetes mellitus among healthcare workers at the Obafemi Awolowo University Teaching Hospitals Complex, Ile-Ife.

Approximately half (44.5%) of the respondents in this study had an above low risk of developing T2DM within 10 years. Similarly, Kurian et al. in 2022 in Dubai reported a high risk of developing diabetes, at 54.9%, among HCWs.[20] This may be because both studies were carried out in a teaching hospital where HCWs may practice under conditions similar to those of OAUTHC. In the same light, the use of the same tool for assessing the risk of developing T2DM and increased knowledge among healthcare workers of the risk factors for diabetes more than the general population would affect the responses to the questions. Carlsson et al. (2020) reported a low risk of 5.1% among physicians in Sweden with respect to diabetes risk across different occupational groups.[21] This may be because their study looked at various occupations.

The findings from this study revealed a significant association between being female and diabetes risk. This finding is in line with previous studies that have shown that females are more susceptible to developing T2DM than males are.[22,23] Opara et al. (2020), in Nigeria, reported a higher prevalence of diabetes among females while looking at the relationship between diabetes risk and adiposity indices in a young adult population in Umudike, Nigeria.[22] Factors that have been implicated in increased diabetes risk among female healthcare workers include hormonal factors (differences in adiposity and metabolic variations), lifestyle factors, and social factors such as gender inequality, discrimination, and stress.[24]

This study revealed a significant association between being married and diabetes risk. The increased risk of T2DM among married individuals, as observed in the current study, is supported by the findings of Egbi et al. (2015) in Yenagoa, Nigeria. Their study indicated that married individuals had a greater risk of developing T2DM than single individuals did, possibly due to the influence of spouses on lifestyle behaviour within marital relationships.[25] Similarly, Kposowa et al. (2021) in the United States examined diabetes risk among widowed/divorced individuals and reported that divorced/separated men and widowed women were at increased risk of diabetes mortality.[26] They concluded that women may have social control over their husbands in marriage concerning eating responsibly. On the other hand, Rahmanian et al. (2016) examined the associations between prediabetes and body mass index and marital status in an Iranian urban population and reported no relationship between marital status and diabetes risk in either sex.[27]

The finding that those with postgraduate education had a

significantly greater risk of diabetes than those with only secondary education is not surprising. Ramatani et al. (2016) in Iran linked high educational status with increased diabetic risk among HCWs.[27] This may be due to the use of similar respondents. However, Indrahadi et al. (2021), in Indonesia, reported a greater risk among those with a low level of education while looking at the prevalence of diabetes mellitus and its relationship with socioeconomic status in the Indonesian population.[28]

Nurses were found to have a greater risk in this study. This finding is consistent with findings by Kurian et al. in 2021, who reported a greater risk of diabetes among nurses than among other healthcare workers.[20] However, a study in Taiwan among female nurses revealed a low risk of developing T2DM among them, which was attributed to their knowledge of good lifestyles.[29] The reasons for this higher risk may be their demanding work schedules, long working hours, and inadequate time for physical activity and healthy eating habits.

There was a significant association between income and the risk of developing diabetes. Healthcare workers who earned more than N100,000 had a greater risk of diabetes. In 2016, Huang et al reported a relationship between higher income and the risk for diabetes among nurses in Taiwan.[29] Similarly, Xu et al. in 2017 and Thanikachalam et al. in 2019 in Thailand reported a significant relationship between high income, high socioeconomic status and diabetes risk.[30,31] They attributed this finding to urbanization and the adoption of diets high in carbohydrates and a high-fat diet, which is similar to the findings of this study. However, other studies have shown a greater risk of diabetes among individuals with lower income levels. Bird et al. (2015) in Canada and Funakoshi et al. (2017) in Japan reported a significant relationship between low income and the risk of developing T2DM among the general population.[1,32] This suggests that many cases of diabetes among low-income individuals may be preventable if equitable measures are taken to reduce their financial gap from higher-income households.

Limitations of the study

This study is limited by its cross-sectional design and the use of a self-administered questionnaire, which may make some respondents have given socially acceptable responses to some questions differing from their actual behaviour despite every effort made to explain the purpose of the study.

In addition, FINDRISC has been used in Nigerian populations, comprehensive external validation and population-specific recalibration among Nigerian healthcare workers remain limited.

Conclusion

A substantial proportion of healthcare workers had FINDRISC scores above the low-risk category. Female sex, ever-married status, postgraduate education, professional category and higher income were independently associated with the dichotomised FINDRISC outcome. Workplace screening and lifestyle-focused preventive

programmes may be useful, while longitudinal studies using validated risk assessment and glycaemic outcomes are needed.

The study underscores the importance of primary prevention strategies tailored to healthcare workers, who are integral to the health system. Future research could explore longitudinal trends and intervention impacts to further understand and reduce T2DM risk in this population.

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