

RESEARCH ARTICLE

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Sociodemographic predictors of modifiable cardiovascular risk factors among medical students in the University of Calabar, Cross River State, Nigeria

Agbor IE¹[ID](#), Eyong UO¹[ID](#), Ogbodum EOU², Isika AI¹[ID](#), Nwoye TO³

¹Department of Community Medicine, University of Calabar, Calabar, Cross River State, Nigeria

²Department of Medicine and Surgery, University of Calabar, Calabar, Cross River State, Nigeria

³Department of Obstetrics and Gynaecology, Federal Medical Centre, Jabi, Abuja, Nigeria

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Abstract

Objectives: The study aimed to determine the prevalence and sociodemographic predictors of modifiable cardiovascular risk factors among clinical medical students at the University of Calabar.

Methods: A descriptive cross-sectional study was conducted among 4th to 6th year medical students selected by the stratified random sampling method. The study population was stratified by academic level (years 4–6), with proportionate allocation used to recruit 94, 138, and 79 students from each level, respectively. Data were collected using a semi-structured, interviewer-administered questionnaire adapted from the WHO STEP-wise approach and analysed with SPSS version 25 at a 5% significance level and 95% confidence interval. Associations were assessed using Chi-square tests. Multivariate logistic regression was used to identify independent predictors of modifiable cardiovascular risk factors.

Results: There were 311 participants comprising 163(52.4%) females and 148(47.6%) males. The overall mean age was 24.6±5.8 years. The prevalence of modifiable cardiovascular risk factors was 58.8%. Statistically significant associations were observed between the presence of cardiovascular risk factors and age ($p=0.039$), academic level ($p<0.001$), tribe ($p<0.001$), and religion ($p=0.048$). Multivariate logistic regression analysis identified older age, 5th year of study and ethnicity as predictors of cardiovascular risk.

Conclusion: Integrating cardiovascular health promotion into the medical curriculum, alongside regular health screening and targeted behavioural interventions, is recommended to reduce modifiable cardiovascular risk factors among students.

Keywords: Cardiovascular risk factors, medical students, prevalence, predictors, University, Calabar

Plain English Summary

This study investigated how common preventable heart disease risk factors are among medical students at the University of Calabar in Nigeria, and what personal characteristics might make students more likely to have these risks. Heart disease is the leading cause of death globally, and many of its causes, like poor diet, lack of exercise, smoking, and being overweight, can be avoided. The researchers surveyed 311 medical students in their fourth, fifth, and sixth years of study, collecting information about their lifestyle habits, measuring their weight and height, and checking their blood pressure.

Correspondence:

Agbor Iwasam E
Department of Community Medicine
University of Calabar, Calabar
Cross River State, Nigeria
08030983599, iwasamelemi1900@gmail.com

The findings revealed that more than half of the students, 58.8%, had at least one preventable heart disease risk factor. The most common problem was being overweight or obese, affecting nearly half of all participants. Unhealthy eating habits were reported by over two in five students, while physical inactivity affected about one in eight. Alcohol use, smoking, and high blood pressure were less common, each affecting fewer than one in ten students.

The study also found that certain groups of students were more vulnerable. Older students and those in their fifth year of study had higher rates of risk factors compared to younger students and those in their fourth year. Students from specific ethnic groups, Efik, Ekoi, and Ibibio, also showed higher risk levels than students from other ethnic backgrounds.

These results are concerning because medical students are training to become doctors who will advise patients on healthy living, yet many of them are carrying preventable risk factors themselves. The demanding nature of medical training, with its long hours, academic stress, and limited time for exercise and healthy meal preparation, likely contributes to these problems. The researchers recommend that universities take action by offering regular health screenings, providing healthier food options on campus, creating better facilities for physical activity, and integrating more health promotion content into the medical curriculum. Special attention should be given to older students and those in later years of study, as they appear to be at greatest risk.

Introduction

Cardiovascular diseases (CVDs) are a constellation of diseases that primarily affect the heart and blood vessels. Together, they constitute the leading cause of mortality and disability globally (1, 2) and the second leading cause of non-communicable diseases (NCD) burden in sub-Saharan Africa (3), with an increasing burden in low- and middle-income countries, including Nigeria. The prevalence of hypertension ranged from 5.4% in Côte d'Ivoire to 11.3% in Madagascar, while the prevalence of at least one chronic disease ranged from 9.7% in Nigeria to 20.6% in Madagascar (1). The disproportionately high mortality rate in low and middle-income countries has been linked to poor levels of awareness, inadequate treatment, and suboptimal control of key cardiovascular risk factors (4). Additionally, emerging data among young adults indicate that the incidence of CVDs has either plateaued or risen in recent decades (5). Modifiable risk factors such as physical inactivity, unhealthy diet, tobacco use, and excessive alcohol consumption contribute significantly to the development of CVDs (6, 7). Accounting for an estimated 17.9 million deaths per year (8). Regarding CVD risk factors, 148 (7.3%) were overweight or obese; 44.0% of males and 36.6% of females reported alcohol consumption (2). Medical students, despite their knowledge, may engage in behaviours that increase their exposure to these risk factors due to academic stress and lifestyle choices (9, 10). Amongst environmental risk factors, air pollution is an important factor (8).

The effects of behavioural risk factors may show up in individuals as raised blood pressure, raised blood glucose, raised blood lipids, and overweight and obesity. Cessation of tobacco use, reduction of

salt in the diet, eating more fruit and vegetables, regular physical activity and avoiding harmful use of alcohol have been shown to reduce the risk of cardiovascular disease. Studies have revealed a concerning prevalence of modifiable cardiovascular risk factors among medical students (6, 11). However, no published study to date has investigated the prevalence of these modifiable risk factors among medical students at the University of Calabar. Adopting findings from other studies may not be appropriate following disparities in findings from health-related issues (12, 13).

The study sought to determine the prevalence of modifiable cardiovascular risk factors (obesity, physical inactivity, smoking, and poor diet), and socio-demographic factors (age, sex, and academic level) associated with the prevalence of modifiable cardiovascular risk factors among medical students at the University of Calabar.

Materials and Methodology

Study Area

The study was conducted in Cross River State, located in the South-South geopolitical region of Nigeria. Cross River State is composed of 18 Local Government Areas and serves as an important administrative, educational, and healthcare hub in the region. The specific study site was Calabar, the capital city of the state and one of its Local Government Areas. Calabar is a coastal city known for its rich cultural heritage, tourism, and the presence of major educational and healthcare institutions. Within Calabar is the University of Calabar, a federal tertiary institution that offers a wide range of academic programs, including Medicine and Surgery. The university houses the College of Medical Sciences, which runs the

Bachelor of Medicine and Bachelor of Surgery (MBBS) programme. Clinical training for medical students in their fourth to sixth years takes place at the University of Calabar Teaching Hospital, a tertiary healthcare facility affiliated with the university. The teaching hospital serves as the primary clinical training centre for medical students, providing them with practical exposure to patient care and clinical practice in various specialities. This clinical environment supports the development of the knowledge and skills required for their professional training as future physicians.

Study Population

The study population comprised undergraduate clinical medical students in Years four, five and six at the University of Calabar. Eligible participants were registered medical students aged 18 years and above who provided informed consent to participate in the study. Students with known cardiovascular conditions currently under medical management and pregnant students were excluded from participation due to the potential confounding influence of these conditions on cardiovascular risk indicators.

Study Design

The study was a descriptive cross-sectional study aimed at assessing the prevalence of modifiable cardiovascular risk factors among medical students. The study was carried out over a period of 5 months from May to September, 2025.

Sample Size Determination

Using the Cochran formula for prevalence studies: $n = \frac{Z^2 p(1-p)}{d^2}$, where $Z = 1.96$, $p = 23.4\%$ as prevalence of students with clustering of ≥ 2 cardiovascular risk factors reported from previous studies in Ibadan (14). Therefore, $n = 275$. Adding 10% for non-response gives a final sample size of 306 participants.

Sampling technique

A stratified random sampling method was used. The study population were stratified by academic level across years four to six, made up of 151, 222 and 127 students, respectively. Thus, 94, 138 and 79 students were proportionately recruited from 4th, 5th and 6th years, respectively.

Data were collected using a semi-structured, interviewer-administered questionnaire adapted from the WHO STEPS instrument.

Data management and analysis

Data collected was entered and analysed using SPSS version 25. Descriptive statistics were used to summarise the sociodemographic variables and the prevalence of each modifiable cardiovascular risk factor. Categorical variables such as gender, academic level, smoking status, and physical activity levels were presented as frequencies and percentages. Kolmogorov test of normality was used to ascertain that the continuous variables like age and body mass index were normally distributed and therefore expressed as means and standard deviations where appropriate. The prevalence of each cardiovascular risk factor (obesity, hypertension, physical inactivity, smoking, poor diet) was computed and presented using tables and charts. Bivariate analysis was conducted using the Chi-square test to examine associations between sociodemographic variables and the overall prevalence of modifiable risk factors. Multivariate binary logistic regression analysis was performed on variables that were significant at the 5% level during bivariate analysis to identify independent predictors of the presence of at least one modifiable cardiovascular risk factor. Clustering of risk factors was assessed by identifying individuals with two or more of the defined risk factors. The proportion of participants meeting this criterion was identified. Descriptive statistics were used to present the distribution of clustering and were presented as figures. All tests were two-tailed, and statistical significance was set at $p < 0.05$ and a 95% confidence Interval.

Results

Table 1 presents the sociodemographic characteristics of study participants. A total of 311 clinical medical students participated in the study. The majority were female, with 163 (52.4%) participants, while males accounted for 148 (47.6%). Most of the respondents [233 (74.9%)] were within the age group of 21–30 years. Regarding their year of study, 138 (44.4%) were in their 5th year, 94 (30.2%) in their 4th year, and 79 (25.4%) in their 6th year.

Table 1: Socio-demographic characteristics of medical students in the University of Calabar (n=311)

Variable	Frequency	Percentage
Sex		
Male	148	47.6

Female	163	52.4
Age group(years)		
<21	38	12.2
21-30	233	74.9
31-40	28	9.0
41 and above	12	3.9
Year of study (clinical students)		
4 th year	94	30.2
5 th year	138	44.4
6 th year	79	25.4
Marital status		
Single	282	90.7
Married	29	9.3
Residential		
On-campus	137	44.1
Off-campus	126	40.5
Living with parent/guardians	13	4.2
Living alone	35	10.9
Tribe		
Efik	43	11.3
Ekoi	17	5.5
Ibibio	31	10.0
Annang	22	7.1
Yoruba	13	4.2
Others	185	59.5
Religion		
Christianity	301	96.8
Islam	5	1.6
Traditional	5	1.6

As shown in Figure 1, the overall prevalence of modifiable cardiovascular risk factors among medical students at the University of Calabar was 183(58.8%).

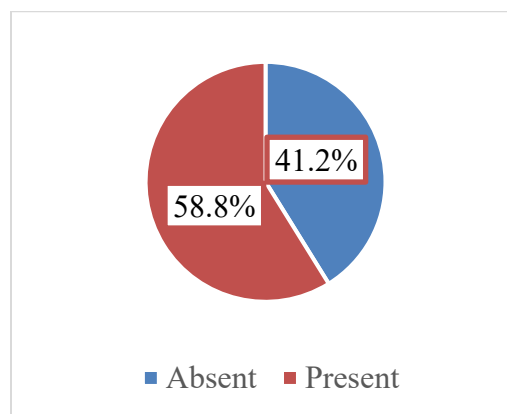


Figure 1: Overall prevalence of modifiable cardiovascular risk factors among medical students in the University of Calabar Teaching Hospital

Figure 2 illustrates the prevalence of specific modifiable cardiovascular risk factors among the study population. The most prevalent risk factor was overweight/obesity, reported by 155(49.8%) respondents, and the least was high blood pressure, found among 12(3.9%) individuals.

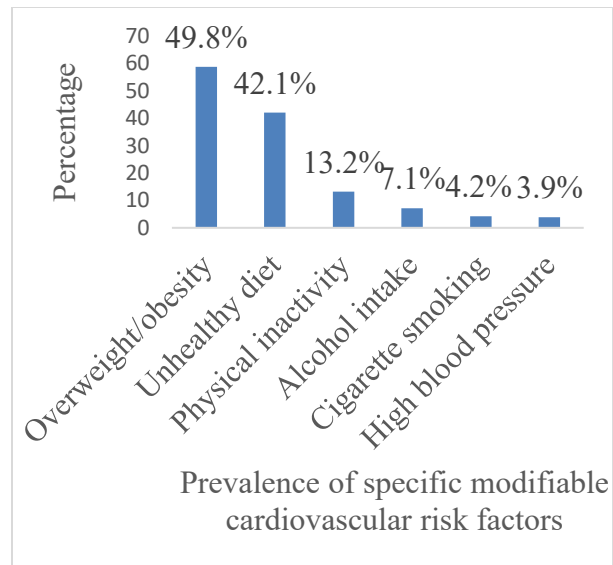


Figure 2: Prevalence of specific modifiable cardiovascular risk factors among medical students in the University of Calabar Teaching Hospital

As shown in Table 2, male students had a higher prevalence of at least one modifiable cardiovascular risk factor compared to females (64.2% versus 54.0%), though this difference was not statistically significant ($p=0.083$). Significant associations were observed with increasing age

($p=0.039$), academic level ($p<0.001$), tribe ($p<0.001$), and religion ($p=0.048$), while marital status and type of residence showed no significant association with the presence of modifiable cardiovascular risk factors ($p>0.05$).

Table 2: Socio-demographic characteristics associated with prevalence of at least one modifiable cardiovascular risk factor (n=311)

Variable	Absent n=128	Present n=183	Total N=311	Chi-square test	p-value
Sex					
Male	53(35.8)	95(64.2)	148(100.0)	3.333	0.083
Female	75(46.0)	88(54.0)	163(100.0)		
Age group (years)					
<21	19(50.0)	19(50.0)	38(100.0)	10.34	0.039*
21-30	101(43.3)	132(56.7)	233(100.0)		
31-40	4(14.3)	24(85.7)	28(100.0)		
≥ 41	4(33.3)	8(6.7)	12(100.0)		
Year of study					
4th year	57(60.6)	37(39.4)	94(100.0)	21.17	<0.001*
5th year	46(33.3)	92(66.7)	138(100.0)		
6th year	25(31.6)	54(68.4)	79(100.0)		
Marital status					
Single	116(41.1)	166(58.9)	282(100.0)	0.001	1.000
Married	12(41.4)	17(58.6)	29(100.0)		
Place of residence					
On-campus	46(33.6)	91(66.4)	137(100.0)	6.257	0.106
Off-campus	60(47.6)	66(52.4)	126(100.0)		
Living arrangement					
Living with parent/guardians	5(38.5)	8(61.5)	13(100.0)		
Living alone	17(48.6)	18(51.4)	35(100.0)		
Tribe					
Efik	4(9.3)	39(90.7)	43(100.0)	64.493	<0.001*
Ekoi	0(0.00)	17(100.0)	17(100.0)		

Ibibio	4(12.9)	27(87.1)	31(100.0)		
Annang	18(81.8)	4(18.2)	22(100.0)		
Yoruba	8(61.5)	5(38.5)	13(100.0)		
Others	94(50.8)	91(49.2)	185(100.0)		
Religion					
Christianity	128(42.5)	173(57.5)	301(100.0)	7.227	0.048*
Islam	0(0.00)	5(100.0)	5(100.0)		
Traditional	0(0.00)	5(100.0)	5(100.0)		

*=statistically significant; CVD=Cardiovascular

Table 3 represents the multivariate binary logistic regression analysis of predictors of the presence of at least one modifiable cardiovascular disease risk factor among clinical medical students. Older age and being in the fifth year were significant predictors of having at least one modifiable cardiovascular disease risk factor. Students aged 31–40 years and those aged 41 years and above

had significantly higher odds of modifiable CVD risk factors compared to those younger than 21 years, while 5th-year students were also more likely to have these risk factors. In contrast, students of Annang, Yoruba, and other ethnic groups had significantly lower odds of having modifiable CVD risk factors. Religion was not a significant predictor.

Table 3: Multivariate binary logistic regression of predictors of the presence of modifiable CVD risk factors among medical students

Variable	Adjusted Odds ratio	95% confidence interval	p-value
Age group(years)			
<21	Reference category		
21-30	1.05	0.379-2.895	0.93
31-40	8.94	1.87-42.709	0.006*
≥41	13.3	2.268-77.985	0.004*
Year of study			
4th year	Reference category		
5th year	6	2.914-12.370	0.000*
6th year	1.53	0.644-3.636	0.335
Tribe			
Efik	Reference category		
Ekoi	0.05	0.113-2.198	0.998
Ibibio	0.81	0.175-3.725	0.785
Annang	0.01	0.002-0.044	0.000*
Yoruba	0.04	0.008-0.192	0.000*
Others	0.07	0.021-0.214	0.000*
Religion			
Christianity	Reference category		
Islam	0.455	0.221-1.766	0.999
Traditional	0.22	0.332-1.543	0.999

*=significant independent predictor of the presence of modifiable CVD risk factors

Discussion

The current study sought to determine the prevalence of modifiable cardiovascular risk factors and examine the socio-demographic factors associated with the presence of these risk factors among medical students at the University of Calabar. Given the increasing global burden of cardiovascular diseases, particularly in low- and middle-income countries, the early identification and understanding of CVD risk profiles among young adults—especially future healthcare providers—is essential for prevention and effective

intervention strategies. Medical students are expected to serve not only as future physicians but also as role models in lifestyle behaviours that influence cardiovascular health. Therefore, findings from this study offer critical insights into the burden and predictors of modifiable CVD risk factors in this important population. In the current study, the overall prevalence of modifiable cardiovascular risk factors among medical students was 58.8%. Overweight and obesity emerged as the most prevalent individual risk factor, affecting 49.8% of the respondents. This

was followed by unhealthy dietary patterns (42.1%), physical inactivity (13.2%), alcohol consumption (7.1%), cigarette smoking (4.2%), and high blood pressure (3.9%). The predominance of overweight/obesity among the students aligns with findings from previous studies, which reported a relatively higher prevalence of overweight/obesity among university students in Nigeria (14, 15, 16, 17, 18, 19, 20). While values from these studies are slightly lower than the 49.8% observed in the current study, the trend underscores the growing concern of weight-related health risks among young adults. Similarly, a systematic review among African University students reported a prevalence range of 0.6–21.7% for obesity among the students (21, 22), and another study in India among students similarly found the preponderance of overweight and obesity (23), indicating that the burden observed in the current study is on the higher end, possibly due to differences in dietary habits, urbanization, or limited physical activity among respondents. Again, other studies reported the prevalence of obesity, while this study reported overweight and obesity together.

The prevalence of unhealthy diets in the current study was 42.1%. The high prevalence of obesity and unhealthy diet among medical students may be attributed to their demanding academic schedules, which often limit time for meal preparation and encourage frequent consumption of fast foods, snacks, and sugar-sweetened beverages. Long hours of lectures, clinical postings, and study sessions may also promote sedentary behaviour and irregular eating patterns, including skipping meals and late-night eating. In addition, stress related to academic workload and examinations can contribute to emotional eating and poor food choices. Limited physical activity, inadequate sleep, and easy access to inexpensive calorie-dense foods within and around campus further increase the risk of unhealthy diet and obesity among medical students. This finding also supports the literature indicating poor dietary behaviours among medical students (24, 25, 26, 27, 28, 29, 30, 31). A study in South India reported that 91.3% of medical students consumed junk food and 97.6% ate fewer than five servings of fruits and vegetables per day (32), reflecting a widespread deficiency in healthy eating practices. Ibrahim *et al.* also noted that a high-fat diet was consumed daily by 73.4% of their study population (16), further emphasising the global nature of poor nutrition among youths. Regarding physical inactivity, 13.2% of respondents in the current study were classified as physically inactive. This is

significantly lower than the 57.9% (16) and the 30% (11) reported in previous studies. However, it aligns with findings by Ameer Khan *et al.*, who noted that medical students were more physically active (86.0%) than the general population (33). The relatively lower rate of inactivity in the current study could be attributed to the awareness of the health benefits of exercise, which medical students are expected to possess. Cigarette smoking was reported in 4.2% of respondents, a figure that aligns closely with previous findings. A previous study among medical students in Central Kerala reported a smoking prevalence of 4% (33), which was significantly lower than in the general population (13.4%). Similarly, Ibrahim *et al.* in their study reported a slightly lower smoking rate of 2.8% (16), while the review by Enoh *et al.* documented a prevalence range of 1.02–13% (21). These findings collectively support the notion that smoking prevalence tends to be lower among medical students, possibly due to increased health literacy and awareness of tobacco-related risks. Alcohol consumption in this study (7.1%) was relatively low compared to figures from other studies. Nyombi *et al.* found alcohol use in 31.7% of participants (34), and Mukhopadhyay *et al.* reported a prevalence of 21.0% (11). The wide variation in alcohol intake rates across studies may reflect cultural, religious, and institutional differences, as well as underreporting due to social desirability bias. High blood pressure was recorded among 3.9% of the students, which is lower than the 9.3% reported by Ibrahim *et al.* (16). and the 14% elevated systolic blood pressure observed by Nyombi *et al.* (34). Enoh *et al.* documented a wide range for hypertension (0.28–26.4%) (21), suggesting variability based on age, obesity levels, and measurement methods. The relatively low prevalence in this study may be attributed to the young age of the participants and possibly early-stage hypertension being undiagnosed or unmeasured. A greater proportion of male students (64.2%) had modifiable CVD risk factors compared to their female counterparts (54.0%). However, this difference was not statistically significant ($p = 0.083$). This finding is consistent with that of Shalihin *et al.*, who reported a higher burden of CVD risk factors among males, including associations with smoking, increasing weight, and higher systolic blood pressure (35). Odunaiya *et al.* reported that female students were more likely to be overweight or obese and had a higher clustering of two or more cardiovascular risk factors among women and Muslims (36). In contrast, the present study found a higher overall prevalence of at least one modifiable cardiovascular risk factor among

male students. This difference may be because our study assessed multiple modifiable risk factors collectively, including smoking, alcohol use, physical inactivity, unhealthy diet, overweight/obesity, and hypertension, rather than focusing mainly on overweight and obesity alone. Since behaviours such as smoking and alcohol consumption are often more common among males, they may have contributed to the higher overall burden of risk factors observed among male students in this study. Age was significantly associated with the presence of modifiable CVD risk factors in this study ($p = 0.039$), with prevalence increasing progressively across age groups and peaking among students aged 31–40 years (85.7%). Multivariate logistic regression further strengthened this finding, showing that students aged 31–40 years were about nine times more likely to have modifiable CVD risk factors compared to those younger than 21 years ($OR = 8.94$; 95% $CI = 1.87–42.71$; $p = 0.006$), while those aged 41 years and above had an even greater likelihood ($OR = 13.30$; 95% $CI = 2.27–77.99$; $p = 0.004$). This pattern is consistent with the findings of Shalihin *et al.* (35), and may reflect the cumulative effect of prolonged exposure to unhealthy lifestyle practices such as physical inactivity, poor diet, alcohol use, and stress as age advances. Academic level also demonstrated a strong and statistically significant association with modifiable CVD risk factors ($p < 0.001$). Fourth-year students had the lowest burden of risk factors (39.4%), whereas the prevalence was considerably higher among fifth- and sixth-year students (66.7% and 68.4%, respectively). On multivariate analysis, fifth-year students were six times more likely to have at least one modifiable CVD risk factor compared to fourth-year students ($OR = 6.00$; 95% $CI = 2.91–12.37$; $p < 0.001$). This increased burden among senior students may be explained by cumulative lifestyle changes during medical training, including increased academic workload, prolonged sedentary habits, reduced time for exercise, and heightened psychological stress. Similarly, Alrasheed *et al.* reported that physical activity levels were significantly associated with academic year, highlighting the influence of academic progression on cardiovascular health behaviours (37). Although marital status and place of residence (on-campus versus off-campus) were not significantly associated with modifiable CVD risk factors in this study ($p = 1.000$ and $p = 0.106$, respectively), tribal and religious affiliations showed significant associations. A high proportion of students from Efik (90.7%), Ekoi (100%), and Ibibio (87.1%) ethnic groups had at least one

modifiable CVD risk factor, whereas lower prevalence was observed among Annang (18.2%) and Yoruba (38.5%) students. Multivariate analysis confirmed that students of Annang ($OR = 0.01$; $p < 0.001$), Yoruba ($OR = 0.04$; $p < 0.001$), and other ethnic groups ($OR = 0.07$; $p < 0.001$) had significantly lower odds of having modifiable CVD risk factors compared to the Efik group. Although literature comparing ethnic variations in cardiovascular risk among medical students is limited, this finding may reflect differences in cultural practices, dietary patterns, and lifestyle behaviours and suggests the importance of culturally sensitive health promotion strategies in multi-ethnic academic settings. Religious affiliation was also significantly associated with the presence of modifiable CVD risk factors at bivariate analysis ($p = 0.048$), with all Muslim and Traditionalist students reporting at least one modifiable risk factor compared to 57.5% of Christians. However, this association did not remain significant after multivariate adjustment, suggesting that religion may be influenced by other underlying sociodemographic or behavioural factors. This finding is comparable to that reported by Odunaiya *et al.* (36).

Study limitation

This cross-sectional study provides only a snapshot and cannot establish causality. Self-reported behaviours may be affected by recall and social desirability bias, and the single-institution setting limits generalizability despite a sample size of 311. These were mitigated by using pretested tools, objective measurements with standardised protocols, and ensuring confidentiality to encourage accurate responses.

Conclusion

This study revealed a high burden of modifiable CVD risk factors among medical students, with an overall prevalence of 58.8%. Overweight/obesity and unhealthy dietary habits were the most common individual risk factors. Sociodemographic factors such as age, academic level, tribe, and religion showed significant associations with the presence of modifiable CVD risk factors.

Given the high prevalence of modifiable cardiovascular risk factors among the students, particularly overweight/obesity and unhealthy dietary practices, there is a need for targeted interventions within the university setting. This should be directed at the university authorities, the College of Medical Sciences, and student health services to implement regular screening programmes for early detection of risk factors,

alongside structured health promotion initiatives focusing on healthy diet and increased physical activity. The university should also provide supportive environments such as access to recreational facilities and healthier food options on campus. Medical students themselves should be encouraged to adopt healthier lifestyles through continuous health education and peer-led initiatives, with particular emphasis on senior students and older age groups who were found to be at higher risk.

Declarations

Ethics approval and consent to participate

Ethical approval was obtained from the Cross River State Health Research Ethics Committee (REC No. CRS/MH/HREC/2025/VOL.V2/1126) before the commencement of data collection. Informed consent was also obtained from study participants before inclusion in the study.

Consent for publication

All authors gave consent for the publication of this work under the Creative Commons Attribution Non-Commercial 4.0 license. No individually identifiable data are reported.

Data availability

The de-identified datasets generated and analysed during the current study are available from the corresponding author on reasonable request.

Competing interests

The authors declare there is no competing interest.

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The research was funded by the authors.

Authors' contributions

AIE conceived and designed the study, developed the study protocol, supervised data collection, conducted data analysis, interpreted the results, and prepared the initial draft of the manuscript.

EUO contributed to study design and development of data collection tools, participated in data collection, assisted with statistical analysis, and critically reviewed the manuscript for intellectual content.

OEOU coordinated fieldwork and data management, supported interpretation of findings, contributed to writing the results section, and participated in manuscript revisions.

IAI participated in the literature review and drafting of the background and discussion sections, assisted with data analysis, and contributed to final manuscript editing.

NTO provided expert input on methodology, reviewed the manuscript for accuracy and clarity, and critically revised the manuscript for submission.

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