Sahel Journal of Life Sciences FUDMA (SAJOLS)
December 2025 Vol. 3(4): 123-130
ISSN: 3027-0456 (Print)
ISSN: 1595-5915 (Online)
DOI: *https://doi.org/10.33003/sajols-2025-0304-15*

Research Article

Prevalence and Predictors of Metabolic Syndrome Among Patients in a Secondary Healthcare Facility in Southwest Nigeria

***Tolulope John Olaomoju and Adesola Helen Oniye**

Department of Medical Laboratory Science, Lead City University, Ibadan, Nigeria
****Corresponding Author's email*: tolulopetoluwene.tt@gmail.com; Phone: +2348109920304**

ABSTRACT
Metabolic syndrome (MetS) is a cluster of metabolic abnormalities that increases the risk of cardiovascular disease and type 2 diabetes. The burden of MetS is growing rapidly in Nigeria, driven by urbanization, sedentary lifestyles, and dietary changes. Early detection in at-risk populations is essential for prevention and management. The study aims to determine the prevalence of MetS and identify its predictors among patients attending Ring Road Specialist Hospital, Ibadan, using the National Cholesterol Education Program Adult Treatment Panel III (NCEP-ATP III) criteria. A cross-sectional study was conducted among 200 participants recruited from the cardiovascular clinic, general outpatient department, and non-patient population working in the hospital. Sociodemographic, lifestyle, medical history, anthropometric, and biochemical data were collected. MetS was diagnosed according to NCEP-ATP III criteria. Statistical analysis included descriptive statistics, chi-square tests, and logistic regression to identify independent predictors. The prevalence of MetS was 51.6%, highest among cardiac patients (88%) and lowest in the non-patient group (12%). Hypertension and abdominal obesity were the most common components. Significant predictors of MetS included elevated HbA1c, high triglyceride levels, low HDL-C, and being in the cardiovascular clinic group. Logistic regression showed that elevated HbA1c (OR=3.01, p<0.001), triglycerides (OR=2.75, p=0.002), and low HDL-C (OR=2.18, p=0.015) independently predicted MetS. MetS is highly prevalent among patients in this secondary healthcare facility, particularly among those with existing cardiovascular disease. Routine screening using HbA1c and lipid profiles, combined with targeted lifestyle interventions, is recommended for early detection and management.

Keywords: Cardiovascular risk; Metabolic syndrome; Nigeria; Predictors; Prevalence

Citation: Olaomoju, T.J., & Oniye, A.H. (2025). Prevalence and Predictors of Metabolic Syndrome Among Patients in a Secondary Healthcare Facility in Southwest Nigeria. *Sahel Journal of Life Sciences FUDMA*, 3(4): 123-130. DOI: *https://doi.org/10.33003/sajols-2025-0304-15*

INTRODUCTION

Metabolic syndrome (MetS) has emerged as one of the most significant public health concerns in the 21st century (Thomaz et al., 2021), representing a constellation of interrelated metabolic abnormalities that substantially increase the risk of cardiovascular disease (CVD), type 2 diabetes mellitus (T2DM), and all-cause mortality (Thomaz et al., 2021). The syndrome is typically defined by the coexistence of central obesity, elevated blood pressure, dyslipidemia, and impaired glucose metabolism. Although initially described as a clinical entity by Reaven in 1988 under the term "Syndrome X," the features of MetS had been recognized as early as 1923 by Kylin, who documented the association between hypertension, hyperglycemia, and gout (Ross, 2020).

Over the past three decades, MetS has gained prominence in clinical discourse due to the increasing prevalence of obesity, sedentary lifestyles, and dietary patterns high in processed foods and saturated fats[1]. Globally, it is estimated that between 20% and 25% of adults meet the diagnostic criteria for MetS, with prevalence rates varying depending on the population, diagnostic criteria used, and socio-economic factors (Blanquet et al., 2019). In developed countries, the prevalence tends to be higher among older adults and those with pre-existing CVD or diabetes (Hu, 2011). However, the burden is rising rapidly in low- and middle-income countries (LMICs), including sub-Saharan Africa, where lifestyle transitions associated with urbanization are accelerating the epidemiological shift towards non-communicable diseases (NCDs) (Blanquet et al., 2019).

Early identification of individuals with MetS offers a unique opportunity for intervention to prevent the onset of CVD and T2DM. Given the multifactorial nature of the syndrome, assessing a combination of predictors—such as anthropometric measures, lipid profiles, and HbA1c levels—may improve diagnostic accuracy and enable earlier intervention.

In Nigeria, where healthcare resources are often limited, cost-effective and easily accessible biomarkers are particularly valuable. Serum lipid profiles and HbA1c testing are relatively inexpensive, widely available in secondary healthcare settings, and minimally invasive. However, there is limited research on their combined predictive value for MetS in the Nigerian population. This study addresses this gap by determining the prevalence of MetS and identifying its predictors among patients attending a secondary healthcare facility in Ibadan.

In Nigeria, the prevalence of MetS varies widely depending on the study population and diagnostic criteria. Community-based studies have reported rates ranging from 12% among rural dwellers to over 40% among urban populations[4]. Hospital-based studies show even higher prevalence, particularly among patients with hypertension or diabetes. This trend is partly attributable to lifestyle changes characterized by reduced physical activity, increased consumption of calorie-dense foods, and rising obesity rates, particularly in urban centers such as Ibadan.

Nigeria is currently experiencing a double disease burden, where communicable diseases persist while NCDs such as CVD and T2DM are increasing. The growing prevalence of MetS in the country is therefore a cause for concern, as it represents an intermediate state between health and overt disease, providing a window of opportunity for prevention. However, in many healthcare settings, MetS is not routinely screened for, and diagnosis often occurs late, when complications have already developed.

Multiple expert groups have proposed diagnostic criteria for MetS, including the World Health Organization (WHO), the International Diabetes Federation (IDF), and the National Cholesterol Education Program Adult Treatment Panel III (NCEP-ATP III). The NCEP-ATP III criteria, widely used in epidemiological and clinical studies, define MetS as the presence of any three or more of the following[5]:

Abdominal obesity

waist circumference >102 cm in men, >88 cm in women.

Elevated triglycerides

≥150 mg/dL (1.7 mmol/L).

Reduced HDL cholesterol

<40 mg/dL (1.03 mmol/L) in men, <50 mg/dL (1.29 mmol/L) in women.

Elevated blood pressure

≥130/85 mmHg or on antihypertensive medication.

Elevated fasting glucose

≥100 mg/dL (5.6 mmol/L) or on antidiabetic medication.

While these criteria were developed in Western populations, they are widely applied in African settings, though some experts have argued for ethnic-specific cut-off points, especially for measures of central obesity.

Several risk factors have been associated with the development of MetS, including advancing age, male gender (in some populations), sedentary lifestyle, unhealthy diet, smoking, and excessive alcohol intake. Clinical and biochemical predictors include elevated triglycerides, low HDL-C, increased waist circumference, elevated fasting blood glucose, and raised glycated hemoglobin (HbA1c) levels.

HbA1c, traditionally used as a marker of long-term glycemic control in diabetes management, is increasingly recognized as a potential early predictor of MetS, even in non-diabetic populations. Elevated HbA1c has been associated with insulin resistance,

dyslipidemia, and increased cardiovascular risk. Likewise, lipid profile abnormalities, particularly elevated triglycerides and low HDL-C, are central components of MetS and have been linked to both cardiovascular morbidity and mortality.

Most Nigerian studies on MetS have focused on tertiary care hospitals or specific high-risk groups such as diabetic or hypertensive patients. However, secondary healthcare facilities, which serve as a critical link between primary and tertiary care, cater to a wide range of patients, including those with undiagnosed or early-stage metabolic disorders. Studying MetS prevalence and predictors in such settings is essential for designing effective screening and intervention programs that can be implemented at the community level.

Furthermore, secondary hospitals like Ring Road Specialist Hospital, Ibadan, are strategically positioned to detect MetS early, before progression to more severe disease states. Understanding the burden and determinants of MetS in these settings can inform targeted preventive strategies, optimize resource allocation, and reduce the overall burden of NCDs.

MATERIALS AND METHODS

Study Design and Setting

This study employed a cross-sectional design and was conducted at Ring Road Specialist Hospital, Ibadan, a secondary healthcare facility in Oyo State, Nigeria. The hospital serves a diverse patient population, including referrals from primary care centers and walk-in patients from surrounding urban and peri-urban communities. The facility houses several specialist clinics, including a cardiovascular clinic, a general outpatient department (GOPD), and diagnostic services such as laboratory and radiology units.

Study Population

The study population comprises of case (adult individuals (aged ≥18 years) attending the cardiovascular clinic, GOPD), and control (non-patient group consisting of apparently healthy individuals visiting the hospital for routine medical checks) groups.

Participant included in the study consist of adults aged 18 years and above, Individuals who provided informed consent, and Patients attending the cardiovascular clinic or GOPD, and non-patients undergoing routine health checks. While those excluded include Pregnant women, Individuals with known chronic liver disease, kidney disease, or thyroid disorders, those on lipid-lowering medications or medications affecting glucose metabolism and the critically ill patients unable to undergo the study assessments.

Sample Size Determination

The sample size was calculated using the formula N = Z^2 x p x 1-p/d^2 (Israel, 1992) studies:

Using a reported prevalence of 16.8% from a prior Nigerian study (Charles-Davies et al., 2021) on apparently healthy adults, the calculated sample size was approximately 200 participants, which was adopted for this study.

Sampling Technique

A purposive sampling technique was used to select participants from the three groups: cardiovascular clinic patients, GOPD patients, and non-patient individuals. Recruitment continued until the desired sample size was achieved, ensuring proportional representation from each group.

Data Collection

Sociodemographic and Lifestyle Data

Information on age, sex, marital status, educational attainment, occupation, smoking history, alcohol consumption, and physical activity was obtained using a structured interviewer-administered questionnaire.

Anthropometric Measurements

Height, weight, body mass index and the waist circumference of the study subjects was measured and recorded.

Blood Pressure Measurement

Blood pressure was measured using a standard mercury sphygmomanometer after the participant had been seated quietly for at least 5 minutes. Two measurements were taken at an interval of at least 2 minutes, and the average was recorded.

Biochemical Analysis

Following an overnight fast of 8–12 hours, 5 mL of venous blood was collected from each participant. The following assays were performed:

Fasting lipid profile

Total cholesterol (TC), triglycerides (TG), high-density lipoprotein cholesterol (HDL-C), and low-density lipoprotein cholesterol (LDL-C) were determined using enzymatic colorimetric methods.

Glycated haemoglobin (HbA1c)

Measured using the direct enzymatic HbA1c assay method, with results expressed as a percentage.

Definition of Metabolic Syndrome

MetS was diagnosed based on the NCEP-ATP III criteria, which define MetS as the presence of any three or more of the following: waist circumference >102 cm (men) or >88 cm (women); triglycerides ≥150 mg/dL; HDL-C <40 mg/dL (men) or <50 mg/dL (women); blood pressure ≥130/85 mmHg or on antihypertensive medication and; fasting blood glucose ≥100 mg/dL or on antidiabetic medication.

Data Analysis

Data were entered and analyzed using SPSS version 26.0 (IBM Corp., Armonk, NY, USA). Descriptive statistics were used to summarize continuous variables (mean ± standard deviation) and categorical variables (frequency and percentage). Comparisons between groups were made using the chi-square test for categorical variables and ANOVA for continuous variables. Pearson's correlation was used to examine relationships between continuous variables. Logistic regression analysis was performed to identify independent predictors of MetS. A p-value <0.05 was considered statistically significant.

Ethical Considerations

Ethical approval for the study was obtained from the appropriate Oyo State Ministry of Health Ethical Committee. Written informed consent was obtained from all participants before data collection. Participation was voluntary, and confidentiality of information was maintained throughout the study.

RESULTS

Sociodemographic Characteristics of the Study Population

A total of 200 participants were enrolled in the study, comprising 93 males (46.5%) and 107 females (53.5%), with a mean age of 54.6 ± 11.8 years. The participants were drawn from three groups: cardiovascular clinic patients (n=100), GOPD patients (n=50), and non-patient individuals (n=50). The majority of participants (61.0%) were aged ≥50 years, and most had at least secondary education (67.5%). A higher proportion of females (58.0%) were found in the cardiovascular clinic group compared to the GOPD (48.0%) and non-patient group (46.0%).

Marital status distribution indicated that 79.5% of participants were married, while 12.0% were widowed, and 8.5% were single. Occupationally, traders and civil servants formed the largest categories, accounting for 32.0% and 25.5% of participants, respectively. Lifestyle habits showed low prevalence of cigarette smoking (6.5%) and alcohol consumption (18.5%).

Prevalence of Metabolic Syndrome

Based on the NCEP-ATP III criteria, the overall prevalence of MetS in the study population was 48.5%. The prevalence was highest among cardiovascular clinic patients (88.0%), followed by GOPD patients (42.0%), and lowest among the non-patient group (12.0%) (p<0.001) (Figure 1).

Distribution of MetS Components

The most prevalent MetS component in the overall population was elevated blood pressure (72.0%), followed by abdominal obesity (65.5%) and reduced HDL-C (55.0%). Elevated triglycerides were found in 48.0% of participants, while elevated fasting glucose was present in 40.5%.

Among cardiovascular clinic patients, hypertension (92.0%) and abdominal obesity (88.0%) were particularly common. In contrast, the non-patient group exhibited the lowest prevalence of all components, with abdominal obesity (18.0%) being the most common.

Table 1. Sociodemographic characteristics of participants by clinic group

Variable	Cardiovascular Clinic (n=100)	GOPD (n=50)	Non-patient (n=50)	Total (n=200)	p-value
Age (years), mean ± SD	57.8 ± 10.4	53.6 ± 11.7	47.2 ± 12.1	54.6 ± 11.8	<0.001
Age ≥50 years, n (%)	82 (82.0)	32 (64.0)	8 (16.0)	122 (61.0)	<0.001
Male, n (%)	42 (42.0)	26 (52.0)	25 (50.0)	93 (46.5)	0.328
Married, n (%)	86 (86.0)	39 (78.0)	34 (68.0)	159 (79.5)	0.042
Secondary education or higher, n (%)	70 (70.0)	32 (64.0)	33 (66.0)	135 (67.5)	0.492

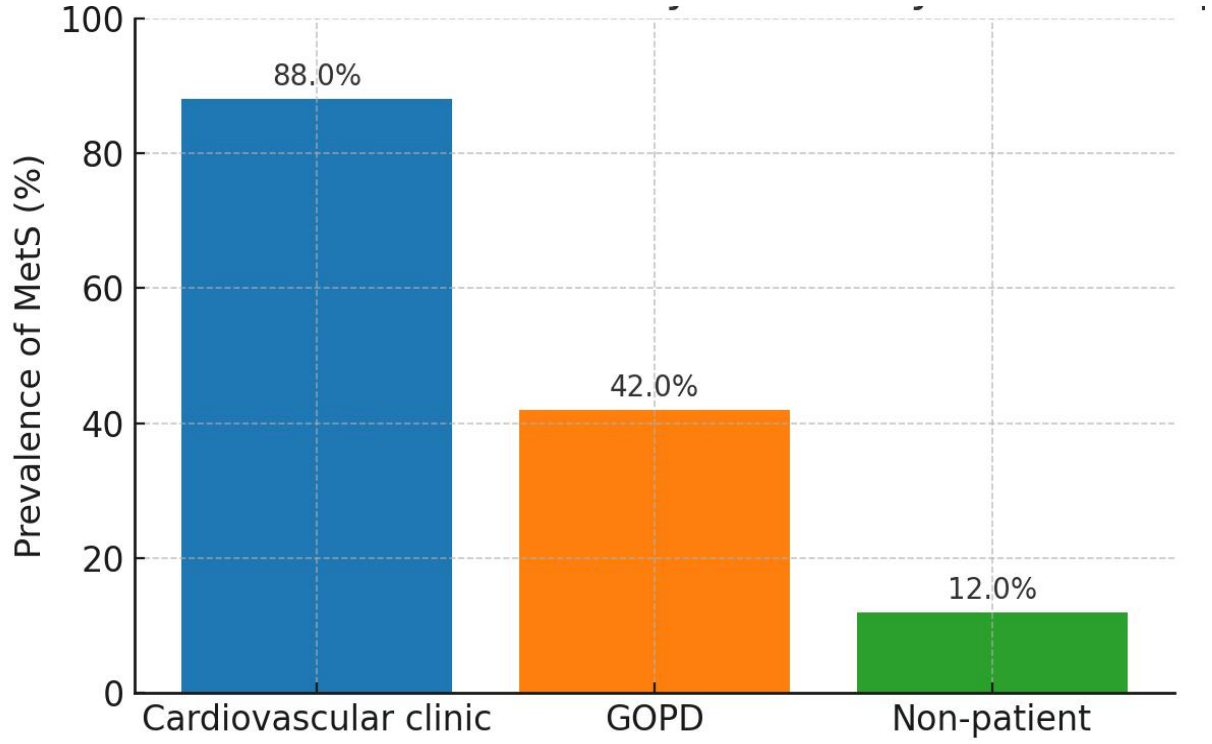

Figure 1. Prevalence of MetS among the study participants

Table 3. Distribution of metabolic syndrome components among participants

Component	Cardiovascular Clinic n=50 (%)	GOPD n=100(%)	Non-patient n=50 (%)	Total n=200 (%)
Hypertension	46(92%)	66(66%)	17(34%)	129(72%)
Abdominal obesity	44(88%)	58(58%)	9(18%)	111(65%)
Low HDL-C	36(72%)	48(48%)	11(22%)	95(55%)
High triglycerides	30(60%)	46(46%)	11(22%)	87(48%)
High fasting glucose	28(56%)	34(34%)	6(12%)	68(40%)

Bivariate analysis showed significant associations between MetS and age group ($p<0.001$), clinic group ($p<0.001$), and educational level ($p=0.042$). Participants aged ≥50 years were more than twice as likely to have MetS compared to those below 50. There was no statistically significant association between MetS and gender ($p=0.328$), marital status ($p=0.178$), or occupation ($p=0.216$).

Mean values for biochemical parameters differed significantly between participants with and without MetS. Those with MetS had significantly higher mean triglyceride levels (2.14 ± 0.81 mmol/L vs. 1.38 ± 0.54 mmol/L, $p<0.001$) and HbA1c (6.48 ± 1.02% vs. 5.84 ± 0.72%, $p<0.001$). HDL-C levels were significantly lower in the MetS group (0.94 ± 0.21 mmol/L vs. 1.12 ± 0.24 mmol/L, $p<0.001$).

Table 4. Mean biochemical values in participants with and without MetS

Parameter	MetS Present (Mean ± SD)	MetS Absent (Mean ± SD)	p-value
Triglycerides (mmol/L)	2.14 ± 0.81	1.38 ± 0.54	<0.001
HDL-C (mmol/L)	0.94 ± 0.21	1.12 ± 0.24	<0.001
HbA1c (%)	6.48 ± 1.02	5.84 ± 0.72	<0.001

Table 5. Multivariate logistic regression analysis of predictors of MetS

Predictor	Adjusted OR	95% CI	p-value
Elevated HbA1c	3.01	1.62–5.59	<0.001
High triglycerides	2.75	1.48–5.12	0.002
Low HDL-C	2.18	1.17–4.07	0.015
Cardiovascular clinic attendance	4.12	2.01–8.45	<0.001

Age ≥50 years was a significant predictor in bivariate analysis but did not remain significant after adjustment for biochemical parameters and clinic group

DISCUSSION

The findings of this study demonstrate that metabolic syndrome (MetS) is highly prevalent among patients attending Ring Road Specialist Hospital, Ibadan, with an overall prevalence of 48.5%. This rate is considerably high and aligns with earlier hospital-based studies in Nigeria, which reported prevalence rates ranging from 40% to 60% among hypertensive and diabetic populations (Nwankwo *et al.,* 2022; Imoh *et al.,* 2023). The observed burden is higher than community-based estimates of 12–25% reported in rural or semi-urban Nigerian populations (Charles-Davies *et al.,* 2021). The sharp contrast underscores the clustering of metabolic abnormalities in clinical populations and reinforces the growing public health concern surrounding cardiometabolic disorders in urban Nigeria.

The prevalence varied significantly across clinical groups, 88.0% among cardiovascular clinic patients, 42.0% among GOPD patients, and 12.0% among non-patient individuals. This gradient reflects the influence of underlying cardiovascular morbidity on MetS manifestation. Patients attending cardiovascular clinics are often hypertensive or dyslipidemic, and their clinical profile predisposes them to meet the diagnostic threshold for MetS. The markedly lower prevalence among non-patient individuals suggests that disease clustering is largely associated with established metabolic or cardiovascular conditions rather than random occurrence in the general population.

Comparable hospital-based findings were reported in studies from Lagos and Enugu, where prevalence among hypertensive or cardiac patients exceeded 80% (Nwankwo *et al.,* 2022), suggesting a consistent pattern across Nigeria's secondary and tertiary healthcare settings. The high prevalence in this current study, therefore, mirrors the nationwide epidemiological transition toward non-communicable diseases driven by urbanization, sedentary lifestyle, and dietary acculturation.

Hypertension (72.0%) and abdominal obesity (65.5%) emerged as the most prevalent components of MetS. These findings corroborate previous reports in sub-Saharan Africa identifying blood pressure elevation and central adiposity as the core drivers of metabolic clustering (Ross, 2020; Imoh *et al.,* 2023). Central obesity, measured by waist circumference, is particularly relevant in African populations due to higher visceral fat accumulation even at lower body mass indices (BMI).

The strong contribution of reduced HDL-C (55%) and elevated triglycerides (48%) further highlights the role of dyslipidemia in the local pathophysiology of MetS. The predominance of low HDL-C mirrors observations from studies in southeastern Nigeria and Ghana, suggesting potential genetic predispositions to low HDL-C levels among Africans (Nwankwo *et al.,* 2022). In contrast, elevated fasting glucose (40.5%) was less common, supporting earlier evidence that glucose abnormalities tend to occur later in the natural progression of MetS, following obesity and hypertension onset.

The study observed a significant association between age ≥50 years and presence of MetS, consistent with evidence that insulin sensitivity, endothelial function, and lipid metabolism decline with age. However, after adjusting for biochemical variables and clinic group, age lost its independent

predictive significance. This implies that age acts as a background risk enhancer, but the direct metabolic disturbances (such as dyslipidemia and hyperglycemia) exert stronger influence on syndrome manifestation.

No statistically significant gender difference was found, echoing some Nigerian and Ghanaian reports where gender disparities diminish after adjusting for BMI and lifestyle (Imoh *et al.,* 2023). This suggests that the observed gender effect in other studies may reflect sociocultural rather than biological influences—such as differences in occupational activity and dietary behavior.

Educational level showed a mild but significant association with MetS, with higher prevalence among those with secondary education or higher. This may reflect urban occupational sedentary patterns and westernized diets associated with higher educational attainment, echoing the "disease of affluence" phenomenon previously reported in urban Africa (Blanquet *et al.,* 2019).

Participants with MetS recorded significantly higher mean triglycerides (2.14 ± 0.81 mmol/L) and HbA1c (6.48 ± 1.02%), with lower HDL-C (0.94 ± 0.21 mmol/L). These biochemical differences were strongly predictive of MetS in the logistic regression model. Elevated HbA1c (OR = 3.01, $p < 0.001$), triglycerides (OR = 2.75, $p = 0.002$), and low HDL-C (OR = 2.18, $p = 0.015$) emerged as independent predictors. The cardiovascular clinic group remained a significant predictor (OR = 4.12, $p < 0.001$), further emphasizing clinical comorbidity as a determinant of metabolic clustering.

The predictive strength of HbA1c aligns with global studies proposing it as a surrogate marker of insulin resistance and chronic hyperglycemia, even among non-diabetic populations. Elevated HbA1c indicates prolonged exposure to glucose toxicity and oxidative stress, which are known to promote endothelial dysfunction, dyslipidemia, and hypertension—the triad central to MetS pathogenesis (Thomaz *et al.,* 2024). These findings underscore the utility of HbA1c as a screening biomarker for early detection of metabolic dysregulation, especially in low-resource settings where fasting plasma glucose testing may be inconsistently available.

The lipid parameters (low HDL-C and high triglycerides) observed as predictors reaffirm the atherogenic dyslipidemia pattern typical of African populations transitioning to Western diets. Elevated triglycerides result from hepatic overproduction of very low-density lipoproteins (VLDL), while low HDL-C reflects impaired reverse cholesterol transport. Together, they confer a high atherogenic index, explaining the cardiovascular vulnerability seen among patients with MetS in Nigeria.

Globally, MetS prevalence varies between 20–25% in general adult populations (Hu, 2011), but the rates observed in this study far exceed that range, suggesting that urban Nigerians attending hospitals have higher cardiometabolic risk exposure. Similar hospital-based findings have been reported in India (45%), Brazil (52%), and Egypt (56%), supporting the global convergence of urban lifestyle-associated metabolic disorders (Blanquet *et al.,* 2019; Thomaz *et al.,* 2024).

This high burden within secondary care patients implies that Nigeria is in an advanced phase of epidemiological transition, with non-communicable diseases overtaking infectious diseases as the major cause of morbidity. Such a trend necessitates urgent policy-level integration of metabolic screening and preventive health services in secondary healthcare systems.

The implications of these findings are multifaceted. Firstly, the high prevalence of MetS among cardiovascular clinic attendees suggests that routine MetS screening should be institutionalized in such units to enable early identification and intervention. Secondly, since HbA1c and lipid profiles were strong independent predictors, these parameters should be integrated into routine laboratory evaluation of patients with hypertension or other chronic conditions.

Thirdly, the study highlights the need for multidisciplinary management combining clinical care with lifestyle modification counseling, dietetics, and community-based education. Early interventions targeting weight control, physical activity, and diet modification could mitigate the metabolic risks and reduce downstream complications such as stroke, myocardial infarction, and type 2 diabetes.

This study contributes valuable data from a secondary healthcare facility, a level often underrepresented in Nigerian epidemiological studies. The use of NCEP-ATP III criteria allows comparability with both local and international studies, and the inclusion of both patients and non-

patient hospital workers provides a broader representation of urban adults in Ibadan. The integration of HbA1c as a predictor variable adds depth to the biochemical understanding of MetS in a Nigerian context.

The cross-sectional design limits causal inference between predictors and MetS. Additionally, the absence of detailed dietary and physical activity assessments constrains interpretation of lifestyle correlates. The relatively small non-patient control group may have led to underestimation of true community prevalence. Nevertheless, the robust analytical approach and clear biochemical differentiation between MetS and non-MetS participants strengthen the validity of the conclusions.

CONCLUSION

This study demonstrates a high prevalence of metabolic syndrome (MetS) among patients attending a secondary healthcare facility in Southwest Nigeria, particularly those receiving care in the cardiovascular clinic. Nearly nine out of ten cardiovascular patients met the criteria for MetS, while the overall prevalence was close to half of the total population studied. Hypertension and abdominal obesity emerged as the most common components, while elevated HbA1c, high triglycerides, and low HDL-C were the strongest independent predictors.

These findings highlight the interconnected nature of cardiometabolic risk factors and the urgent need for early detection, especially in high-risk patient groups. Routine use of HbA1c and lipid profile screening in secondary healthcare facilities could substantially improve early diagnosis and management of MetS.

There is need for routine screening, integrate waist circumference, blood pressure, HbA1c, and lipid profile testing into routine care for patients in cardiovascular and general outpatient clinics. Prioritize targeted interventions for patients aged ≥50 years and those with elevated HbA1c or abnormal lipid profiles, given their high risk. Establish multidisciplinary teams including physicians, nurses, dietitians, and medical laboratory scientists to provide comprehensive management. Organise outreach programs to detect MetS components early, especially in semi-urban and rural communities transitioning to urban lifestyles. Promote dietary modification, regular physical activity, and weight control through mass media and community programs. There is need to conduct prospective studies to track the incidence and progression of MetS and its complications over time. Incorporate detailed dietary and physical activity data in future research to better understand modifiable risk factors in Nigerian populations.

REFERENCES

Blanquet, M., Legrand, A., Pélissier, A., & Mourgues, C. (2019). Socio-economic status and metabolic syndrome: A meta-analysis. *Diabetes & Metabolic Syndrome: Clinical Research & Reviews, 13*(3), 1805–1812. https://doi.org/10.1016/j.dsx.2019.04.003

Charles-Davies, M. A., Oyedepo, R. O., Olorunsogo, O. O., & Akinloye, O. A. (2021). Prevalence and risk factors of metabolic syndrome among apparently healthy adults in Southwest Nigeria. *African Journal of Biomedical Research, 24*(2), 205–213. https://doi.org/10.4314/ajbr.v24i2.11

Hu, F. B. (2011). Globalization of diabetes: The role of diet, lifestyle, and genes. *Diabetes Care, 34*(6), 1249–1257. https://doi.org/10.2337/dc11-0442

Imoh, L., Ani, C. A., Iyua, K., et al. (2023). Metabolic syndrome in HIV: Prevalence, correlates, concordance of diagnostic criteria and relationship to carotid intimal media thickness in a sub-Saharan population. *Nigerian Medical Journal, 64*(4), 478–491. https://www.ajol.info/index.php/nmj/article/view/261650

Israel, G. D. (1992). Determining sample size. *University of Florida Cooperative Extension Service, Institute of Food and Agricultural Sciences, EDIS.* https://doi.org/10.32473/edis-pd006-1992

Nwankwo, M., Okamkpa, C. J., & Danborno, B. (2022). Comparison of diagnostic criteria and prevalence of metabolic syndrome using WHO, NCEP-ATP III, IDF and harmonized criteria: A case study from urban southeast Nigeria. *Diabetes & Metabolic Syndrome: Clinical Research & Reviews, 16*(12), 102665. https://doi.org/10.1016/j.dsx.2022.102665

Ross, R. (2020). Waist circumference as a vital sign in clinical practice: A consensus statement from the IAS and ICCR working group on visceral obesity. *Nature*

Reviews Endocrinology, 16(3), 177–189. https://doi.org/10.1038/s41574-019-0310-7

Thomaz, F. S., John, O. D., Sinha, P., Shafie, S. R., & Worrall, S. (2024). The metabolic syndrome: An overview and proposed mechanisms. *Obesities, 4*(3), 226–255. https://doi.org/10.3390/obesities4030020