Determinants of metabolic syndrome in OVIA North-East LGA of Edo State Nigeria: A sociodemographic perspective

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Abstract
Metabolic syndrome (MetS) is a major public health concern marked by a cluster of interconnected risk factors, including hypertension, obesity, hyperglycemia, and dyslipidemia. This study was aimed to assess the prevalence and associated sociodemographic factors of MetS in a rural population in southern Nigeria. Conducted at Igbinedion University Teaching Hospital in Edo State, Nigeria, the study involved 75 out of 6,400 screened patients, selected using simple random sampling based on the World Health Organization’s MetS criteria for adults. The results indicated a MetS prevalence of 1.2%, with a higher prevalence among females (65.3%) than males (34.7%). The majority of cases (47%) were middle-aged individuals (45-64 years) (p < 0.05), while the age group 18-25 years had the fewest cases (2.7%). Among the patients, 73.3% were farmers, 4% were petty traders, and 2.7% were carpenters, with bankers, secretaries, hairdressers, and students each accounting for 1.3%. Most patients had a low level of education (84%), with 42% being females and 21% males, while 16% had tertiary education. Furthermore, 40% of patients with low education levels were in the middle-aged group (45-64 years). Christians made up 98.7% of the sample, with Muslims comprising 1.3%, reflecting the predominantly Christian population of southern Nigeria. The findings underscore age, gender, and socioeconomic status as risk factors for MetS.

Keywords: Metabolic syndrome, World Health Organization, MetS inclusion criteria, sociodemographic and socioeconomic factors, risk factors, Southern Nigeria

Introduction
Metabolic syndrome (MetS) is described as an assemblage of pathological, biochemical, clinical, and metabolic factors that significantly elevate the risk of atherosclerotic cardiovascular disease (ASCVD), type 2 diabetes mellitus (T2DM), and overall mortality \(^1\). \(^2\). This array of unhealthy body measurements and abnormal laboratory test results includes atherogenic dyslipidemia, hypertension, glucose intolerance, a pro-inflammatory state, and a prothrombotic state. Several diagnostic criteria for MetS exist, but the most commonly used criteria currently come from the World Health Organization (WHO), the National Cholesterol Education Programme Adult Treatment Panel III (NCEP ATP III) \(^3\), the European Group for the Study of Insulin Resistance (EGIR), the International Diabetes Federation (IDF) and American Association of Clinical Endocrinologists (AACE) \(^4\). The list of the primary components of metabolic syndrome continues to grow as new information emerges. These components now include hyperinsulinemia, insulin resistance, increased plasma triglycerides (TG), central obesity, decreased high-density lipoprotein cholesterol (HDL-C), a shift in LDL particle pattern to small dense particles (type B pattern), a procoagulant state (elevated plasma fibrinogen and plasminogen activator inhibitor-1 (PAI-1)), vascular abnormalities (increased urinary albumin excretion, endothelial dysfunction), inflammatory markers, and hyperuricemia \(^5\) in addition to those previously mentioned. The global prevalence of MetS varies widely, ranging from less than 10% to as much as 84% depending on the region, whether the environment is urban or rural, the population’s composition (including sex, age, race, and ethnicity), and the diagnostic criteria used \(^6\), \(^7\). It has been observed that the prevalence of MetS increases from age 20 through the sixth and seventh decades of life for males and females, respectively \(^8\).

In African populations, the prevalence of MetS can range from as low as 0% to as high as approximately 50% or even higher, depending on the population setting \(^9\), \(^10\).
2. Methods
An observational study with both cross-sectional and retrospective elements was conducted among 75 adult patients who met the WHO inclusion criteria for MetS at Igbinedion University Teaching Hospital, Okada, Edo State, Nigeria. The university is situated in Okada, the headquarters of Ovia North-East Local Government Area, Edo State, with a latitude of 6.323°N and a longitude of 5.621°N. This area covers 2,301 km² and had a population of 153,849 according to the 2006 census [11]. Patients were selected by simple random sampling every week for 16 months (March 2022 - July 2023) at the General Outpatient Unit of IUTH until the sample size was reached. The data was assessed for completeness, serialized, coded and entered into Statistical Package for Scientific Solution (SPSS 20) for analysis. The results were presented in a frequency table. Bivariate analysis was done using the chi-squared test with a p-value of less than 0.05 considered statistically significant. The data collected was based on self-reporting and is therefore subject to information bias. The ethical clearance to carry out the survey was sought and obtained from the Igbinedion University Teaching Hospital Ethical Committee. Confidentiality was assured by informing respondents that personal information would not be divulged.

3. Results and Discussion
3.1 Gender-based prevalence of metabolic syndrome patients
The prevalence of metabolic syndrome overall was 1.2% with males representing 0.4% and females 0.8%. Contrary to this, a higher prevalence (12.1%) was seen in a study done in a rural setting in Southwestern Nigeria by Olaire et al. in 2010 [12]. This low prevalence may be due to several factors such as poor health-seeking behaviour which may stem from poor health knowledge/education and financial impediments which ultimately affect their presentation at health facilities even when faced with complications of this disease [13]. In another study by Bilog et al. in 2023 [14], which assessed the prevalence of metabolic syndrome and its components in rural, semi-urban and urban areas in the littoral region in Cameroon, the prevalence of MetS was found to be higher in urban areas (37.2%), followed by the rural areas (36.8%) and finally, semi-urban (25.9%) [14].

Females (65.3%) were more in proportion than the male (34.7%) patients in this study as shown in Table 1. Gender disparities in the prevalence of metabolic syndrome have been observed in many studies, potentially due to varying criteria such as waist circumference (WC) and HDL-C used to define MetS. For instance, the Arkhangel study in Russia, Korea and China showed a predominance of metabolic syndrome in females [13]. This finding is consistent with data from the Frinks cohort [16] study and studies in Pakistan, indicating a worrying trend of higher metabolic syndrome prevalence in women compared to men. This trend is highly attributed to the increasing rates of obesity among women, with developing countries, including those in Southeast Asia, currently experiencing 2 million more affected women than men [17, 18]. In 2017, a study by Nohert and Blessing found a higher prevalence of metabolic syndrome in females compared to males (38.8% vs 15.3%, p<0.0001) [18].

3.2 Age-based prevalence of metabolic syndrome patients
The age aggregation of patients in this study as seen in Table 2 was mostly middle-aged (46-65 years, 47%) followed by patients who were young adults and elderly (26-45 years and > 65 years respectively, each responsible for 25.3% of respondents). This is in keeping with a rural study conducted in Southern India in which most of the participants with metabolic syndrome were between the ages of 48 and 68 years [21]. The age-specific prevalence of metabolic syndrome as defined by the International Diabetes Federation and the National Cholesterol Education Program, was 11% among individuals aged 20-29 years and 47.2% among those aged 80-89 years [22]. The combination of age-related physiological changes, hormonal fluctuations, increased risk of chronic diseases, and lifestyle factors contributes to the heightened susceptibility of middle-aged patients to metabolic syndrome [23].

3.3 Religious demographics of Patients with MetS
Religious demographics show that Christians make up 98.7% of the study population, while Muslims account for 1.3%. This distribution in Table 3 reflects the religious composition of the sample rather than a direct link to MetS as religious affiliations in present times are more of a means of social identification [24]. This is in sequence with the Nigeria Religious Records which stipulates that the South in which the Edos are situated, is predominantly Christian, with the Igbo and Ijaw tribes being 98% Christian. The Yoruba tribe in the West is 55% Muslim and 35% Christian [25].

3.4 Relationship between level of education, age and gender of patients with MetS
This study revealed that 84% of patients had a low level of education as shown in Fig 1, with females bearing a 42% occurrence in both men (83%) and women (86%), with the prevalence increasing with age in both genders. Moreover, The National Center for Biotechnology Information (NCBI) search in 2017 revealed data from the National Health and Nutrition Examination Survey (NHANES), indicating a significant increase in MetS prevalence among individuals of Mexican descent, non-Hispanic white women, and non-Hispanic black women. This data confirms that women are disproportionately affected by metabolic syndrome [20].
burden, while 40% of patients with a low level of education belonged to the 45-64 age group (p > 0.05) as illustrated in Fig 2 and 3 respectively. A study utilizing NHANES data found that low education levels (odds ratio (OR), 1.56; 95% confidence interval (CI), 1.32-1.84) and advanced age (OR, 1.73; 95% CI, 1.67-1.80) were independently linked to a higher likelihood of developing metabolic syndrome during the period from 2007-2012 [20, 17]. Another study examined the efficacy of a multidimensional self-management intervention for women with low education levels and metabolic syndrome. The intervention group, which consisted of women with six years of education or less, participated in a program involving lifestyle modifications, goal setting, coaching, peer support, problem-solving, and self-monitoring [26]. The female dominance in illiteracy in this result can be attributed to the fact that families in chronically poor rural areas often lack the financial resources to send all their children to school. In these situations, parents may prioritise sending boys to school over girls. Supportably, in some rural communities, there are cultural expectations that girls will marry young and focus on domestic duties rather than pursuing education. This leads to lower school attendance and investment in girls’ human capital [27].

Fig 1: Distribution of level of Education of Patients with MetS

Fig 2: Relationship between level of education and gender in MetS patients
3.5 Occupation of Patients with MetS

Fig 4 shows the pie chart distribution of the occupation of patients with MetS. 73.3% of patients were farmers, 14.7% were lecturers, 4% were petty traders and 2.7% were carpenters, while hairdressers, secretaries, bankers and students accounted for 1.3% each. This aligns with a study conducted in the Western Cape Province of South Africa, which found a high prevalence of MetS in a community of farm workers of both genders \cite{28}. Additionally, a population-based longitudinal study in Korea identified pesticide exposure as a potential risk factor for metabolic syndrome, particularly among female farmers \cite{29}. Cremonini \textit{et al.} challenged the widespread belief that farmers have better health by uncovering a significant prevalence of MetS among farmers in Southeastern Brazil. Their findings identified gender, BMI, age, and land ownership as the primary risk factors for MetS in this population. They also highlighted obesity, the consumption of ultra-processed foods over natural foods, and the inflammatory profile as the key contributors to the high prevalence of MetS among farmers \cite{30}. In contrast, a study by Strauß \textit{et al.} demonstrated that sedentary occupations significantly tend towards obesity, with office workers having a notably larger abdominal waist circumference compared to firefighters \cite{31}. However, from an occupational perspective, Nair's study in 2010 revealed no difference in the predisposition of MetS between manual and non-manual workers \cite{32}. 

Fig 3: Relationship between Level of Education and Age in MetS patients

Fig 4: A pie chart distribution of patients with MetS based on occupation
4. Conclusion
The findings emphasize that age, gender, and socioeconomic factors, especially education level and occupation, are significant risk factors for MetS. These insights highlight the necessity for targeted public health interventions aimed at middle-aged women, individuals with lower educational attainment, and farmers to effectively address and mitigate the risk factors associated with MetS in this region.

5. Acknowledgement
We wish to acknowledge the Igbinedion University Teaching Hospital (IUTH), Medical Advisory and Ethical Committee respectively for their assistance in facilitating the completion of this study.

Conflict of Interest
Not available

Financial Support
Not available

6. References


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