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WEST AFRICAN JOURNAL OF MEDICINE

ORIGINAL ARTICLE

Prevalence and Predictors of Metabolic Syndrome among Adults in North-Central Nigeria

Prévalence et Prédicteurs du Syndrome Métabolique chez les Adultes Dans le Centre-Nord du Nigéria

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ABSTRACT

BACKGROUND: Metabolic syndrome contributes to the burden of non-communicable diseases and is a growing public health problem in both developed and developing countries. We determined the prevalence and predictors of metabolic syndrome among adults in Benue State, North-Central, Nigeria to guide targeted interventions.

METHODS: We conducted a community-based cross-sectional study in Benue State, North-Central, Nigeria. Multistage sampling technique was used to recruit 823 respondents. We defined metabolic syndrome using the National Cholesterol Education Programme Adult Treatment Panel III guideline and adapted a component of the WHO Stepwise questionnaire for data collection. Prevalence of metabolic syndrome and the associated risk factors were estimated using Chi square test and logistic regression at 5% level of significance. Statistical analysis was done using SPSS version 23.0.

RESULTS: The mean age of the respondents was 40.1± 15.7 years. Most of the respondents were literate (86.8%) and married (67.0%). The prevalence of metabolic syndrome was 19.4%. One in every four of the respondents had pre-metabolic syndrome (25.6%) and this was more in females (28.2%) compared to males (22.9%). Thirty-four percent of the respondents had only one whereas 20.7% did not have any of the risk factors for metabolic syndrome. Age [aOR:10.3; 95%CI: 4.8-22.2], sex [aOR:2.4; 95%CI: 1.7–3.5] and education [aOR:2.9; 95%CI: 1.4–6.1] were significantly associated with metabolic syndrome among the respondents.

CONCLUSION: The prevalence of metabolic syndrome was high. The associated risk factors were age, gender and educational status. Therefore, interventions should be targeted at young adults to reduce the long-term impact of the disease. **WAJM 2022; 39(4): 375–380.**

Keywords: Prevalence, risk factors, metabolic syndrome, Nigeria.

RÉSUMÉ

CONTEXTE: Le syndrome métabolique contribue à la fardeau des maladies non transmissibles et est un public croissant problème de santé dans les pays développés comme dans les pays en développement. Nous avons déterminé la prévalence et les prédicteurs du metabolism syndrome chez les adultes dans l'État de Benue, centre-nord du Nigéria pour orienter les interventions ciblées.

MÉTHODES: Nous avons mené une enquête transversale communautaire étude dans l'État de Benue, centre-nord du Nigéria. Multistage la technique d'échantillonnage a été utilisée pour recruter 823 répondants. Nous avons define syndrome metabolique à l'aide du National Cholesterol Programme d'éducation Groupe de traitement des adultes III lignes directrices eta adapté une composante du questionnaire Par étapes de l'OMS pour collecte de données. Prévalence du syndrome métabolique et des facteurs de risque associés ont été estimés à l'aide du test du chi carré et la régression logistique à un niveau de signification de 5 %. Statistique l'analyse a été effectuée à l'aide de SPSS version 23.0.

RÉSULTATS: L'âge moyen des répondants était de 40.1 ± 15,7 ans.La plupart des répondants étaient alphabétisés (86.8 %) et mariés(67.0%). La prévalence du syndrome métabolique était de 19.4%.Un répondant sur quatre avait un prémétabolique(25.6 %) et c'était plus fréquent chez les femmes (28.2 %)comparativement aux hommes (22.9 %). Trente-quatre pour cent des n'en avaient qu'un, alors que 20.7 % n'en avaient aucun les facteurs de risque du syndrome métabolique. Âge [aOR:10.3; IC à 95 %:4.8-22.2], le sexe [aOR:2.4; IC à 95 %: 1.7-3.5] et l'éducation [aOR:2.9;IC à 95 % : 1.4 à 6.1] étaient significativement associés au metabolism chez les répondants.

CONCLUSION: La prévalence du syndrome métabolique était haut. Les facteurs de risque associés étaient l'âge, le sexe et le statut scolaire. Par conséquent, les interventions devraient être ciblées chez les jeunes adultes pour réduire l'impact à long terme de la maladie. **WAJM 2022; 39(4): 375–380.**

Mots-clés: Prévalence, facteurs de risque, syndrome métabolique, Nigéria.

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Abbreviations: BMI, Body Mass Index; **BP,** Blood Pressure; **BS,** Blood Sugar; **DM,** Diabetes Mellitus; **HDL-C,** High-density Lipoprotein-Cholesterol; **IGT,** Impaired Glucose Intolerance; **MS,** Metabolic Syndrome; **NCEP,** National Cholesterol Education Programme; **TC,** Total Cholesterol; **TG,** Triglycerides; **WC,** Waist Circumference.

INTRODUCTION

Metabolic syndrome (MS) refers to a combination of risk factors including central obesity, glucose intolerance, hyperinsulinemia, low HDL cholesterol, high triglycerides and hypertension.[1,2] Metabolic syndrome is a known risk factor for cardiovascular disease (CVD) and CVD-related mortality, which accounts for over 31% of all deaths globally.[2–4] In addition, it is associated with an increased risk for development of type 2 diabetes which is associated with multiple debilitating or fatal health complications such as blindness, renal failure, stroke and neuropathy.[2,5] The International Diabetes Federation estimates the prevalence of metabolic syndrome at 20–25% in the adult population globally, and up to 80% risk of death from CVD among those affected.[2] Globally, the prevalence of MS is estimated to be increasing, largely attributed to increasing obesity and sedentary lifestyles.

Developing countries are experiencing rapid urbanization with changes in lifestyle characterized by excess calorie intake and physical inactivity. In sub-Saharan Africa, there are rapid demographic and epidemiological transitions leading to the rising burden of cardiovascular diseases and other non-communicable diseases.[6–8] Metabolic syndrome significantly contributes to the burden of non-communicable diseases and is a growing public health problem in both developed and developing countries.[9]

Just as in other countries in sub-Saharan Africa, Nigeria is faced with an increasing burden of non-communicable diseases in the context of a health system that is already overstretched by a high background burden of communicable diseases. According to WHO 2010 estimates, CVD deaths account for 12% of all deaths in Nigeria.[10] The rising burden of non-communicable diseases is largely attributed to rapid industrialization with increased rural-urban migration, social and behavioral changes characterized by unhealthy lifestyles, decreased physical activity, poor dietary habits, tobacco use, and increased alcohol consumption which are also known risk factors for metabolic syndrome.[11] Despite its known association with increased risk of CVD, metabolic syndrome is still understudied in Nigeria. Only a few population-based studies have been reported in southwest Nigeria[12] and southeast Nigeria.[13–15] Nigeria is a large country occupied by several ethnic groups. The patterns of diseases may vary by ethnicity because of social-cultural differences. It is therefore important to study every unique region of the country in order to more accurately characterize the burden of Metabolic Syndrome in Nigeria. This will also be important in informing the development of targeted interventions to address the rising burden of CVDs. The aim of this study was to assess the prevalence and the predictors of the metabolic syndrome in the adult population of Benue State in North-Central Nigeria.

SUBJECTS, MATERIALS AND METHODS

Study Setting, Design and Sample Size

A population-based cross-sectional study conducted from July to August 2017 in Benue State, Nigeria. There are 23 Local Government Areas (LGAs) in Benue State. The study was conducted in 6 LGAs (Kastina-Alla, Markudi, Obi, Oturkpo, Takar and Ushongo) across the three senatorial zones in the state. The study population comprised all eligible respondents aged 18 years and above. The sample size of 823 was calculated based on WHO recommended formula for population based survey for non-communicable diseases.[16]

Study Population and Sampling Technique

All eligible adults of 18 years and above, resident of the area who consented were included in the study. Pregnant women, chronically ill, mentally impaired, and unconscious persons were excluded.

Participants were selected using multistage sampling technique. The selection procedure was done at different levels including, Local Government, enumeration areas and household. One adult was selected per household.

Study Instrument and Data Collection

We used the WHO STEPS-wise questionnaire for data collection. The questionnaire has been validated in Africa for NCD data collection.[17] The questionnaire had information on socio-demographic characteristics, anthropometric, blood pressure, and biochemical measurements of cholesterol and triglycerides. Anthropometric measurements were obtained with the participant wearing light clothing and no footwear. We measured body weight to the nearest 0.1 kg using a digital scale (OMRON BF212) and height to the nearest 0.1 cm in the standing position using a portable stadiometer. We also assessed the waist circumference to the nearest 0.1 cm using tension tape, directly over the skin or light clothing at the level of the midpoint in between the inferior margin of the last rib and iliac crest along the mid axillary line. Three consecutive BP measurements in an interval of at least five minutes were done in sitting position using a digital device (Omron M6 Comfort). We also estimated the average systolic and diastolic blood pressure after the second and third readings. Trained research assistants administered the questionnaire and carried out the anthropometric measurements under supervision.

Measurement of Variables

Metabolic syndrome was defined using the National cholesterol education programme (NCEP) adult treatment panel (ATP) III criteria.[18] According to this criteria, a subject has metabolic syndrome if he or she has three or more of the following: waist circumference >102 cm in men and >88 cm in women; triglyceride levels $\geq$ 150mg/dL; HDL cholesterol concentration <40 mg/dL in men and <50 mg/dL in women; blood pressure $\geq$ 130/85 mmHg; and fasting plasma glucose value $\geq$110 mg/dL. Those respondents who had at least two of the risk factors but do not meet the criteria for MS were classified as pre-MS.[19]

Data Analysis

We used Statistical Package for the Social Sciences software version 23.0 to estimate the prevalence of metabolic syndrome, and the relationship between sociodemographic characteristics and metabolic syndrome using Chi squared statistics. The variables that were

significant at bivariate analysis were modelled in multiple logistic regression at 5% level of significance.

Ethical Consideration

The ethical approval for the study was obtained from National Health Research and Ethics Committee (NHREC) with approval number NHREC/01/01/2007–22/12/2016. The study objectives and procedure were explained to each participant and written informed consent obtained. Confidentiality, privacy, voluntariness and anonymity of respondents were assured.

RESULTS

Eight hundred and twenty-three respondents were included in the study, with 347(51.8%) males and 397(48.2%) females. The mean age of the respondents was 40.1± 15.7 years and 540(54.7%) were below 40 years. Most of the respondents were literate 823 (86.8%) and married 551(67.0%, Table 1).

The females had higher odds of having low HDL (COR: 3.8; 95%CI: 2.9–5.2) and central obesity (COR: 6.8; 95%CI: 4.7–10.1) compared to males. The odds for elevated blood pressure was 30% lower in males compared to females (COR: 0.7; 95%CI: 0.5–0.9, Table 2).

The overall prevalence of metabolic syndrome was 19.4% and the prevalence was higher among females (25.8%) than males (12.6%). MS increased with increasing age in both males and females (Figure 1). The mean age of respondents with MS (47.5±13.7 years) was significantly higher than those without MS (38.3 ± 15.7, p<0.001).

One in every four of the respondents had pre-metabolic syndrome (25.6%) and this was more in females (28.2%) compared to males (22.9%). Thirty-four percent of the respondents had only one risk factor, whereas 20.7% did not have any of the risk factors for metabolic syndrome (Figure 2).

We found statistically significant association between age, sex, education, marital status, place of residence of the respondents and metabolic syndrome (p < 0.001, Table 3).

The odds for metabolic syndrome among those > 60 years was 10 times higher compared to those in the 18–29 years age group (aOR:10.34; 95%CI: 4.8–22.2). Females had 2.4 times odds for metabolic syndrome more than males (aOR: 2.4; 95% CI: 1.7–3.5), it was higher for respondents with tertiary education compared to those with no education (aOR: 2.8; 95% CI: 1.4–6.1). The odds for metabolic syndrome was also 2.5 times higher among those in urban settings compared to the rural (aOR: 2.5; 95% CI: 1.6–3.9, Table 4).

Table 1: Socio-demographic Characteristics of Respondents (N = 823)

Variables	Frequency	Percentage
Age (years)		
18 – 29	251	30.5
30 – 39	199	24.2
40 – 49	136	16.5
50 – 59	117	14.2
≥60	120	14.6
Sex		
Male	426	51.8
Female	397	48.2
Education		
No formal	109	13.2
Primary	147	17.9
Secondary	288	35.0
Tertiary	279	33.9
Marital status		
Single	180	21.9
Married	551	67.0
Separated	15	1.8
Divorced	6	0.7
Widowed	71	8.6
Location		
Rural	259	31.5
Urban	564	68.5

Table 2: Distribution of the Components of Metabolic Syndrome Disaggregated by Sex

Variables	Females Frequency (%)	Males Frequency (%)	COR (95%CI)
Low HDL			
Yes	236 (70.9)	97 (29.1)	3.8 (2.9–5.2)
No	190 (38.8)	300 (61.2)	
Central obesity			
Yes	179 (82.5)	38 (17.5)	6.8 (4.7–10.1)
No	247 (40.8)	359 (59.2)	
Elevated BP			
Yes	137 (46.0)	161 (54.0)	0.7 (0.5–0.9)
No	289 (55.0)	236 (45.0)	
Elevated Triglyceride			
Yes	90 (47.9)	98 (52.1)	0.8 (0.6–1.1)
No	336 (52.9)	299 (47.1)	
Elevated blood sugar			
Yes	54 (52.9)	48 (47.1)	1.1 (0.7–1.6)
No	372 (51.6)	349 (48.4)	

COR, Crude Odds ratio

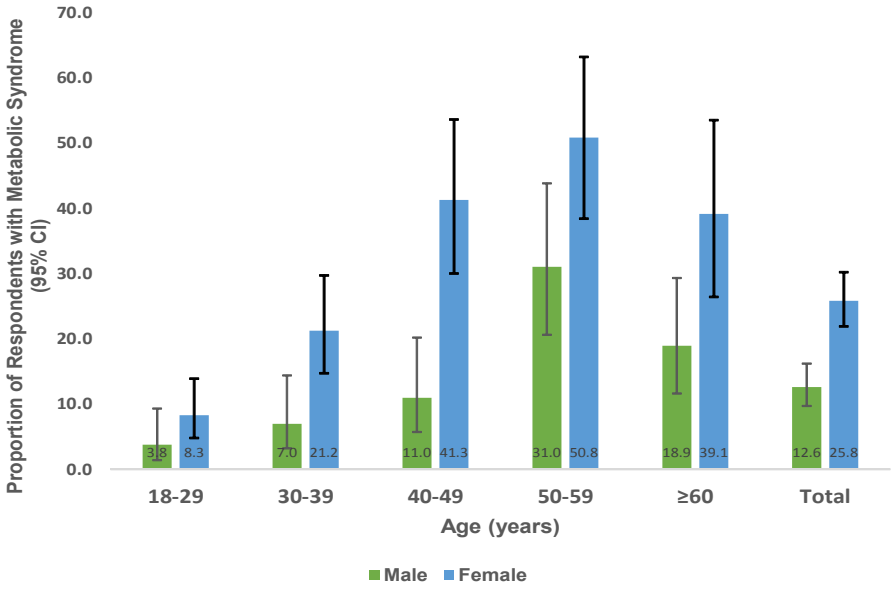
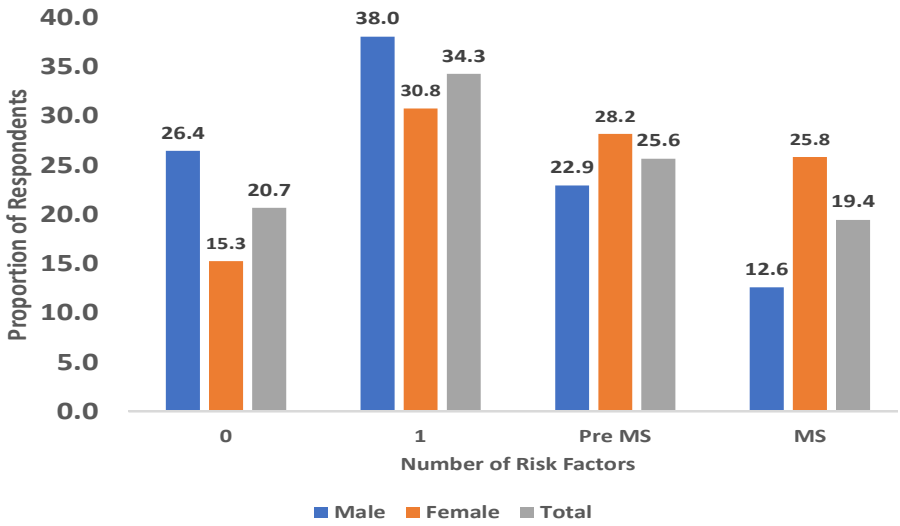


Fig. 1: Prevalence of Metabolic Syndrome Stratified by Age and Sex.



(MS: Metabolic syndrome; Pre MS: Pre metabolic syndrome)

Fig. 2: Proportion of Risk Factors for Metabolic Syndrome by Sex.

DISCUSSION

We found a high overall prevalence of metabolic syndrome among the subjects. This prevalence was higher than what was reported in some previous studies done in semi-urban and rural communities in Nigeria[12,20,21] and elsewhere in Africa.[22,23] However, the prevalence was lower than those reported in other studies in Africa.[24–27] These variations in prevalence could be due to the differences in demographics and criteria used in selection of study participants across the different parts of Africa. Also, the various studies used different classifications in defining MS and none of the prevalences were weighted. Epidemiological and nutritional transition may probably explain the rising trend of MS.

The prevalence of MS was higher among females compared to males across all age groups in the study population. Similar findings in gender variation have been reported.[21,28–30] This could be due to a higher prevalence of obesity and visceral obesity among females. In addition, many cultures in Africa perceive obesity in female as a sign of affluence and good living. The use of lower cutoff points for waist circumference could account for the higher prevalence in females. Therefore, planning and implementation of control programs for MS should be family-centered with special consideration to gender disparity. The perception of cultural influences on obesity among females should be further explored.

The prevalence of MS increased with age and was most common in the age group 50–59years. The prevalence of metabolic syndrome which increased with age could be due to a decrease in physical activity and effects of change in dietary habits. The relationship of MS with age has earlier been reported.[30–32]

We also observed that young adults (<40years) had high prevalence of MS. This age group is the working class, probably with better income, and they are more likely to change their dietary habits and lifestyle. These changes fuel the rising trend of MS and non-communicable diseases with advancing age. Interventions should therefore be targeted at these cohorts to reduce the impact on life expectance and quality of life.

Metabolic syndrome was associated with education. Respondents with tertiary education had higher odds of developing MS compared to those with no formal education. A similar observation has been reported.[30] This finding could be due to the fact that those with higher levels of education attainment were more likely to adopt sedentary lifestyles due to the nature of their work. They are equally more likely to earn more and adopt westernized dietary habits.

We also a found high prevalence of pre-MS among the study population. The rates were higher in females compared to males. The high level of pre-MS is worrisome in our environment where health seeking behaviour is poor, particularly in the absence of focused intervention programmes for non-communicable diseases (NCDs). These large groups are at higher risk of transiting to MS.[33] Therefore, an integrated, multidisciplinary risk management approach should be adopted in the control of NCDs.

Table 3: Relationship between Socio-demographic Characteristics and Metabolic Syndrome among Respondents (N = 823)

Characteristics	Presence of Metabolic Syndrome		p-value
	Yes (n=160)	No (n=663)	
Age (years)			
18 – 29	16 (6.4)	235 (93.6)	<0.001
30 – 39	30 (15.1)	169 (84.9)	
40 – 49	34 (25.0)	102 (75.0)	
50 – 59	48 (41.0)	69 (59.0)	
≥ 60	32 (26.7)	88 (73.3)	
Sex			
Male	50 (12.6)	347 (84.4)	<0.001
Female	110 (25.8)	316 (74.2)	
Education			
No formal	20 (18.4)	89 (81.6)	<0.001
Primary	33 (22.5)	114 (77.5)	
Secondary	35 (12.2)	253 (87.8)	
Tertiary	72 (25.8)	207 (74.2)	
Marital status			
Single	10 (5.6)	170 (94.4)	<0.001
Married	122 (22.1)	429 (77.9)	
Separated	2 (13.3)	13 (86.7)	
Divorced	1 (16.7)	5 (83.3)	
Widowed	25 (35.2)	46 (64.8)	
Location			
Rural	28 (10.8)	231 (89.2)	<0.001
Urban	132 (23.4)	432 (76.6)	

Table 4: Logistic Regression of Factors associated with Metabolic Syndrome

Variable	Metabolic Syndrome		aOR (95% CI)	*p* -value
	Yes	No		
Age (years)				
18 – 29	16 (6.4)	235 (93.6)	Ref.	
30 – 39	30 (15.1)	169 (84.9)	2.4 (1.3 – 4.7)	0.008
40 – 49	34 (25.0)	102 (75.0)	6.0 (3.0 – 11.9)	<0.001
50 – 59	48 (41.0)	69 (59.0)	13.7 (6.8 – 27.8)	<0.001
≥ 60	32 (26.7)	88 (73.3)	10.3 (4.8 – 22.0)	<0.001
Sex				
Male	50 (12.6)	347 (84.4)	Ref.	
Female	110 (25.8)	316 (74.2)	4.1 (2.7-6.4)	<0.001
Education				
None	20 (18.4)	89 (81.6)	Ref.	
Primary	33 (22.5)	114 (77.5)	2.1 (1.0 – 4.4)	0.035
Secondary	35 (12.2)	253 (87.8)	2.0 (1.0 – 4.4)	0.066
Tertiary	72 (25.8)	207(74.2)	2.6 (1.3 – 5.2)	0.009
Location				
Rural	28(10.8)	231(89.2)	Ref.	
Urban	132(23.4)	432((76.6)	2.3 (1.4 –4.0)	0.001

CONCLUSION

The prevalence of metabolic syndrome was high especially among young adults. The prevalence was found to increase with age. It was also found to be significantly associated with age, sex and education. Therefore, interventions should be targeted at younger adults and those with pre-metabolic syndrome to reduce the long-term impact of the disease.

Ethical Approval and Consent to Participate

The ethical approval for the study was obtained from National Health Research and Ethics Committee (NHREC) with approval number NHREC/01/01/ 2007–22/12/2016. The study objectives and procedure were explained to each participant and written informed consent obtained. Confidentiality, privacy, voluntariness and anonymity of respondents were assured.

Competing Interests

The authors declare that there are no competing interests.

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