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Clustering of metabolic syndrome and its risk factors among adult Nigerians in a national health insurance scheme primary care clinic of a tertiary hospital in south-eastern Nigeria

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Abstract: Background: The increasing incidence of MetS in Nigeria is a national health problem. As the case detection of MetS increases in different Nigerian populations evaluating for its clusters among NHIS patients in primary care setting is an important health service challenge that is often overlooked. Aim: This study was designed to determine the prevalence of MetS and its risk factors among adult Nigerians in a NHIS primary care clinic of a tertiary hospital in South-eastern Nigeria.Materials and Methods: This was a primary care clinic-based cross sectional study carried out on 210 adult NHIS patients using International Diabetes Federation(IDF) criteria: An Individual was considered to have MetS in the presence of waist circumference(WC) ≥94 cm for men and ≥80 cm for women plus any two or more of the following: systolic and/or diastolic blood pressure ≥130/85 mmHg and/or hypertension on treatment; fasting blood glucose ≥ 100mg/dL and/or diabetes mellitus on treatment; triglyceride level ≥150 mg/dL and/or hypertriglyceridaemia on treatment and high density lipoprotein(HDL-C) cholesterol <40mg/dL for men or <50 mg/dL for women and/or HDL-C dyslipidaemia on treatment. Data was collected using pretested, structured and researcher administered questionnaire. Results: The prevalence of MetS was 38.6%. MetS was significantly associated with old age≥40 years(p=.002), female sex(p=.044), family history of hypertension(p=.036) and physical inactivity(p=.001). The most significant predictor of MetS was physical inactivity.[OR=3.09 , CI=(1.81-10.06), p=.001]. The patients with MetS were three times more likely to be physically inactive compared to their non-MetS counterparts. Conclusion: This study has shown that MetS exist among the study population and was significantly associated with old age ≥40 years, female sex, family history of hypertension and physical inactivity. The most significant predictor variable was physical inactivity. NHIS patients in the primary care clinic should be the focus of primary and secondary preventive interventions for MetS.

Keywords: Adult Nigerians, Mets, NHIS, Prevalence, Primary Care Clinic, Risk Factors

1. Introduction

Metabolic syndrome (MetS) is a global medical problem [1,2] presently escalating in developing countries[3,4]] as an important component of non-communicable disease burden. It is a multi-factorial disorder that represents a clustering of risk factors that lead to an increased incidence of cardio-metabolic disorders.[5-8] Specific set of criteria have been used by different Working Groups for clinical and epidemiological diagnoses of MetS.[9-13] The set of criteria include the revised third report of National Cholesterol Education Panel(NCEP) in adult (ATP III) criteria(NCEP-ATP III),[9] World Health Organization(WHO) criteria,[10] International Diabetes

Federation(IDF) criteria,[11] American College of Endocrinology criteria(ACE)[12] and The European Group for the study of Insulin Resistance(EGIR)criteria.[13] The most widely used clinic-based MetS diagnostic criteria are those of IDF-criteria and NCEP-ATP III criteria.[3,14] The defining elements of MetS using IDF-criteria is the presence of waist circumference(WC) ≥94 cm for men and ≥80 cm for women plus any two or more of the following: systolic and/or diastolic blood pressure ≥130/85 mmHg and/or hypertension on treatment; fasting blood glucose ≥ 100mg/dL and/or diabetes mellitus on treatment; triglyceride level ≥150 mg/dL and/or hypertriglyceridaemia on treatment and high density lipoprotein(HDL-C) cholesterol <40mg/dL for men or <50 mg/dL for women and/or HDL-C dyslipidaemia on treatment.[11]

The prevalence of MetS varies by definitions and diagnostic criteria across different parts of the world: In United States of America(USA) the prevalence varies from 16% of black men to 37% of Hispanic women[15], prevalence of 39.3% was reported in Saudi Arabia[16], 29.7% was reported in India[17] and 35.9% in Ghana,[18] 43.3% was reported in Ethiopia,[19] 15.9% was reported in Enugu, South eastern Nigeria[20] and 14.9% was reported in Abuja, Nigerian capital city.[21]

The magnitude of MetS has been reported in specific high risk patients population such as those who were obese: prevalence of 46.3% was reported in Quatar, [22] 40.2% was reported in Malaysia[23], and 53.0% was reported in Italy.[24] Among patients with type 2 diabetes mellitus, the prevalence of metabolic syndrome of 77.2% was reported in diabetics in India.[25], 25.2% was reported in diabetics in Western Nigeria[26] and 63.6%% was reported in Jos, Northern Nigeria.[27] In hypertensive patients prevalence of 15.9% was reported in Enugu, South eastern Nigeria [20] and prevalence of 42.9% was reported in Osogbo, Western Nigeria.[14]

The variability of MetS syndrome within and across the world population is a factor of genetic(family history),[28] metabolic[29] and socio-environmental factors.[7,30,31] The predominant underlying risk factors of MetS appear to be insulin resistance[5] and abdominal obesity. [32] The associated risk factors include physical inactivity [6,15] and other enhancing risk factors.[6,8]

There have been reports of on the emergence of MetS in different populations in Nigeria.[7,14,20,21,26,27] However nothing is known about the magnitude of MetS in primary care clinic of NHIS in Nigeria. These NHIS patients were sampled because they are patients' population likely to be affected by adoption of western lifestyle characterized by sedentary lifestyle, consumption of fast foods amidst other non-constitutional factors that cluster in dysmetabolic syndrome. Of great concern in the study area is that MetS is serendipitously found in NHIS patients in the primary care clinic of the hospital and MetS also occur concurrently in adult patients with component defining criteria for MetS at initial diagnosis. Even in mild degrees, MetS has serious medical consequences and poses additional socio-psychological challenges leading to poor quality of life and may have untoward direct and indirect consequences on work force aliveness and productivity. In view of the epidemiological transition towards cardio-metabolic disorders in Nigeria[33], establishing a baseline for the distribution and determinants of MetS in these patients and evaluating them during subsequent patients visits appropriately can provide primary care physicians with excellent means of educating their patients on lifestyle modifications. It is on this premise that the authors were motivated to determine the prevalence of MetS and its risk factors among adult Nigerians in a National Health Insurance Scheme(NHIS) primary care clinic of a tertiary hospital in South-eastern Nigeria.

2. Materials and Methods

2.1. Ethical Consideration

Ethical certificate was obtained from the Health Research and Ethics Committee of the hospital. Informed consent was also obtained from patients included in the study.

2.2. Study Design

This was a primary care clinic-based cross sectional study carried out on 210 adult Nigerians attending the NHIS primary care clinic between February 2012 and May 2012 at the department of Family Medicine of Federal Medical Centre, Umuahia, a tertiary hospital in Umuahia, Abia state, South-Eastern, Nigeria.

2.3. Study Setting

Umuahia is the capital of Abia state, South-East Nigeria. The State is endowed with abundant mineral and agricultural resources with supply of professional, skilled, semi-skilled and unskilled manpower. Economic and social activities are low compared to industrial and commercial cities such as Onitsha, Port Harcourt and Lagos in Nigeria. Until recently, the capital city and its environ have witnessed an upsurge in the number of banks, hotels, schools, markets, industries, junk food restaurants in addition to the changing dietary and social lifestyles.

Federal Medical Centre, Umuahia is located in the metropolitan city of Umuahia. It is a tertiary hospital established with the tripartite mandate of service delivery, training and research and serves as a referral Centre for primary and secondary public health institutions as well as missionary and private hospitals in Abia state and neighbouring states of Imo, Ebonyi, Rivers and Akwa Ibom states of Nigeria.

The department of Family Medicine serves as a primary care clinic for NHIS patients within the tertiary hospital setting of the Federal Medical Centre. All adult patients excluding those who need emergency services, paediatric patients and antenatal women are first seen at the department of Family Medicine where diagnoses are made.

Patients who need primary care are managed and followed up in the clinic while those who need other specialists care are referred to the respective core specialist clinics for further management. The clinic is run by Consultant Family Physicians and postgraduate resident doctors in Family Medicine.

2.4. Study Population

The study population was made up of 210 adult NHIS patients who had WC ≥94 cm for men and ≥80 cm for women using IDF criteria and who met the inclusion criteria.

2.5. Inclusion and Exclusion Criteria

The inclusion criteria were NHIS patients with WC ≥94 cm for men and ≥80 cm for women aged ≥ 18 years who gave informed consent for the study. The exclusion criteria were critically ill patients, pregnant women, women in pueperium, patients with demonstrable ascites and intra-abdominal masses determined by history and physical examination.

2.6. Sample Size Determination

Sample size estimation was determined using the formula[34] for calculating minimum sample size $N=Z^2pq/d^2$ where N=Minimum sample size, Z=Standard normal deviation usually set at 1.96 which corresponds to 95% confidence interval, P=Proportion of the population estimated to have a particular characteristic. Proportion was taken from previous study in Abuja, Nigeria [21] = 14.9% (0.15). q=1.0 - p=1.0- 0.15=0.85, d=degree of accuracy set at 0.05. Hence $N= (1.96)^2 \times 0.15 \times 0.85/ (0.05)^2$. Therefore, N=196. The calculated minimum sample size was 196. However, to improve the precision of the study, the estimated sample size=Ns was determined considering an anticipated response rate of 90%(0.9). The estimated sample size (Ns) was determined by dividing the original calculated sample size (N) by the anticipated response rate as follows, Ns= N/0.9, [34] where N=Minimum calculated sample size, Ns=Selected sample size, anticipated response rate=0.9. Thus, the estimated sample size = 196/0.9= 217. However, selected sample size of 210 patients was used based on the duration of the study.

2.7. Sampling Technique

The sample selection was done consecutively using every NHIS adult patient who registered to see the clinicians on each consulting day during the study period and who met the inclusion criteria. This sampling technique was judge mentally chosen by the authors based on the fact that the researchers believed that those selected were likely to be representative of the study population.

2.8. Diagnostic Procedure for Mets

Metabolic syndrome components were evaluated by anthropometric determination of waist circumference, clinical evaluation of blood pressure and laboratory assessment of fasting plasma glucose and lipid profile.

The WC was measured using flexible non-stretchable tape.[35,36] The subject stood erect with arms at the side and feet together. The researcher faced the subject. The iliac crest and lower rib cage were first identified by palpation. The WC was taken as the midpoint between the lower border of lower rib cage and iliac crest in a horizontal plane parallel to the floor.

The blood pressure was measured using auscultatory method with standard mercury in glass Accuson sphygmomanometer.[35-37] Prior to the measurement, the patient was seated and rested for 5 minutesin sitting position on a chair that supported the back comfortably. The left arm muscles were relaxed and the forearm was supported with the cubital fossa at the heart level. A cuff of suitable size was applied evenly to the exposed arm. The cuff was rapidly inflated until the manometer reading was about 30 mmHg above the level at which the pulse disappeared and then slowly deflected. During this time, the Korotkoff sounds were monitored using a Litman stethoscope placed over the brachial artery. The systolic blood pressure was noted at the pressure at which the first heart sounds were heard(Korotkoff phase I). The diastolic blood pressure was taken as the pressure at the point when the heart sounds disappeared(Korotkoff phase v). The blood pressure was also measured in the right arm as described for the left arm in order to rule out significant inter-arm blood pressure difference and the arm that gave the higher reading was subsequently used.

The blood glucose was determined after an overnight fast between 8.00 hours to 10.00 hours using venous plasma by glucose oxidase method.[35-37]

The fasting lipid profile: triglycerides and high density lipoprotein cholesterol were determined after an overnight fast between 8.00 hours to 10.00 hours by enzymatic method.[35-37]

2.9. Diagnostic Criteria for Mets Using IDF Criteria

The Metabolic syndrome was defined using IDF-criteria, [11] an Individual was considered to have MetS in the presence of waist circumference(WC) ≥94 cm for men and ≥80 cm for women plus any two or more of the following: systolic and/or diastolic blood pressure ≥130/85 mmHg and/or hypertension on treatment; fasting blood glucose ≥ 100mg/dL and/or diabetes mellitus on treatment; triglyceride level ≥150 mg/dL and/or hypertriglyceridaemia on treatment and high density lipoprotein(HDL-C) cholesterol <40mg/dL for men or <50 mg/dL for women and/or HDL-C dyslipidaemia on treatment.

3. Methods

Data collection instrument was adapted from the generic WHO-STEPS instrument approach to surveillance of chronic non-communicable diseases risk factors [38] and

was modified to suit Nigeria environment through robust review of relevant literature [4,7,20,22,23,30,31,36,39,40] The socio-demographic variables of age, sex, marital status, education and personal histories and diagnoses of principal components of metabolic syndrome were obtained. The behavioural factors assessed were physical activity profile, alcohol and tobacco use, dietary fruits and vegetables consumption during meal times and the type of oils used in meal preparations.

The family history of hypertension, diabetes mellitus, abdominal obesity and stroke was coded as yes or no for the presence or absence of hypertension, diabetes mellitus, abdominal obesity and/or stroke in any of the first, second or third degree generation family members respectively.

The behavioural risk factor of physical activity was assessed by inquiring how many times the respondents engaged in physical activities in the previous 7 days. Those who engaged in activities that cause a moderate or large increase in breathing or heart rate for ≥ 30 minutes for ≥ 3 days/week were considered physically active while the level of activity below this was considered physical inactivity. Subject's occupational, leisure-related and activities of daily living were taken into account in assessing for the physical activity. Physical activity responses were graded into: never (0 times/week), rarely (<30 minutes in <3 days/week) and often times (≥30 minutes in ≥3 days/week). Physical activity was categorized as active or inactivity. Those who had 0 time/week(never) or <30 minutes in <3 days/week(rarely) were considered physically inactive while those who had ≥30 minutes in ≥3 days/week (oftentimes) were considered physically active. Alcohol consumption was assessed in the previous 12 months preceding the study and coded yes or no for someone who used less than a unit or a unit of any type of alcohol daily or occasionally in 12 months preceding the study or someone who had never used alcohol in the previous 12 months preceding the study respectively. A unit of alcohol is equivalent to 10 g of alcohol. Similarly, tobacco use was evaluated with respect to the use of smoked and smokeless tobacco in the lifetime and coded yes or no for someone who had used smoked or smokeless tobacco in any form either daily or occasionally in their lifetime or someone who had never used tobacco in their lifetime respectively. The dietary fruits and vegetables consumption were evaluated by asking how many days in the previous 7 days did the respondents eat fruits and vegetables. The dietary responses were graded into: never (0 serving/week), rarely (<3 servings/week) and oftentimes (≥3 servings/week). Those who had ≥3 servings/week had adequate dietary fruits intake while those who had 0 serving/week and <3 servings/week had inadequate dietary fruits and vegetables consumption respectively. The question on dietary use of oils was got by inquiring in the previous 7 days the type of oil used in household meal preparations. The dietary oils were classified into saturated and unsaturated oils based on the type of oils available in Nigeria.

The information on personal behavioural measurements was based on previous 7 days physical activity and dietary recall method. This method was expected to give required information on physical activity and dietary assessment based on the feasibility and the Nigerian practice population setting. The researchers explained briefly the concept of the study and made vigorous effort to maximize positive response in order to minimize the potential for information bias especially response acquiescence, social desirability response, floor and ceiling effects.

The pre-testing of the questionnaire was done internally at the primary care clinic using five non-NHIS patients who had MetS. The pre-testing of the questionnaire lasted for two days. The respondents for the pre-testing of the questionnaire were selected haphazardly from the clinic. The pretesting was done to find out how the questionnaire would interact with the respondents and ensured that there were no ambiguities. However, no change was necessary after the pre-test as the questions were interpreted with the same meaning as intended. The questionnaire instrument was interviewer-administered. Language used was English Language. However, local languages were used to explain verbally to the patients who could not understand the medical language in the questionnaire. The questionnaire was administered once to each eligible respondent.

3.1. Operational Definitions

The researchers defined young adult patients as those aged less than 40 years and old adults as those ≥ 40 years. Biosocial risk factors of MetS refer to antecedent condition(s) whose presence is(are) positively associated with an increased probability that MetS will develop later. Family history of component defining criteria for MetS such hypertension, type 2 diabetes mellitus and/or abdominal obesity refers to previous information on the occurrence of hypertension, type 2 diabetes mellitus and/or abdominal obesity in any of the first, second or third degree generation family members who were dead or alive made by a health professional. Primary care refers to the care provided by physicians specifically trained for comprehensive first contact and continuing care for undifferentiated patients including early detection, management of the patient, health promotion and maintenance.[36]

3.2. Statistics

The results generated were analyzed using software Statistical Package for Social Sciences (SPSS) version 13.0, Microsoft Corporation, Inc. Chicago, IL, USA. Categorical variables were described by frequencies and percentages. Bivariate analysis involving Chi-square test was used to test for the significance of associations between categorical variables. To determine the odd ratio, the authors controlled for the patients with MetS using those without MetS within the study population. Furthermore, to identify predictor variables independently related with MetS, logistic

regression analysis was performed at 95% confidence limit. A p-value p<.05 and/or confidence limits which didn't embrace unity(1) were considered statistically significant.

4. Results

Of the 210 patients who had abdominal obesity, 38.6%(81) had MetS. [Table 1] The age of these patients ranged from 18 years to 60 years with a mean age of 43 ± 5.1 years. There were 69 (32.9%) males and 141 (67.1%) females with male to female ratio of 1: 2. Other demographic profiles of the study population are shown in table 2.

Bivariate analysis of the relationship between MetS, socio-demographic variables, family history and lifestyle factors showed that variables such as old age≥40 years (X^2=7.10, p-value=.002); female sex (X^2=5.26, p-value=.044), family history of hypertension(X^2=8.80, p-value=.036) and physical inactivity(X^2=12.70, p=0.001) were statistically significant while other variables such as marital status(p=.210), educational attainment(p=.098), family history of diabetes(p=.116), family history of abdominal obesity(p=.204), family history of stroke(p=.088), alcohol consumption(p=.330), tobacco use(p=.399), dietary fruits consumption(p=.094), dietary vegetables consumption(p=.075) and dietary oils consumption(p=.091) were not statistically significant. [Table 2].

Table 1. *Distribution of the patients' based on MetS status using IDF diagnostic criteria.*

Parameter (Status)	Number	Percentage
MetS present	81	38.6
MetS absent	129	61.4
Total	210	100.0

Table 2. *Relationship between MetS, socio-demographic variables, family history and lifestyle factors among the study population.*

Variable	Metabolic syndrome		X^2	P-value
	Present N=81 Number(%)	Absent N=129 Number(%)		
Age(years)				
<40	25(30.9)	87(67.4)		
≥40	56(69.1)	42(32.6)	7.10	.002*
Sex				
Male	29(35.8)	40(31.0)		
Female	52(64.2)	89(69.0)	5.26	.044*
Marital status				
Single	13(16.0)	29(22.5)		
Married	61(75.3)	92(71.3)		
Widowed	5(6.2)	4(3.1)		
Separated/Divorced	2(2.5)	4(3.1)	4.03	.210
Education				
Secondary and less	70(86.4)	22(17.1)		
Post-secondary and more	11(13.6)	107(82.9)	6.16 .098	
Family history of hypertension				
Yes	61(75.3)	78(60.5)		
No	20(24.7)	51(39.5)	8.80	.036*
Family history of type 2 diabetes				
Yes	26(32.1)	17(13.2)		
No	55(67.9)	112(86.8)	4.70	.116
Family history of abdominal obesity				
Yes	11(13.6)	10(7.8)		
No	70(86.4)	119(92.2)	4.23	.204
Family history of stroke				
Yes	8(9.9)	13(10.1)		
No	73(90.1)	116(89.9)	5.18	.088
Physical activity				
Active	12(14.8)	33(25.6)		
Inactive	69(85.2)	96(74.4)	12.70	.001*
Alcohol consumption				
Yes	37(45.7)	91(70.5)		
No	44(54.3)	38(29.5)	6.90	.330
Tobacco use				
Yes	10(12.3)	18(14.0)		
No	71(87.7)	111(86.0)	5.70	.309
Dietary fruits consumption				
Adequate	15(18.5)	39(30.2)		
Inadequate	66(81.5)	90(69.8)	8.01	.094

Variable	Metabolic syndrome		X^2	P-value
	Present N=81 Number(%)	Absent N=129 Number(%)		
Dietary vegetables consumption				
Adequate	27(33.3)	75(58.1)		
Inadequate	54(66.7)	54(41.9)	7.55	.075
Dietary oil consumption				
Saturated	13(16.0)	19(14.7)		
Unsaturated	68(84.0)	110(85.3)	5.65	.091

*=Significant

On logistic regression of the statistically significant variables, old age≥40 years and physical inactivity remained statistically significant with physical inactivity being the most statistically significant predictor variable of MetS. A significantly higher proportion of patients with MetS were physically inactive compared to those without MetS(OR=3.09, CI=1.81 – 10.06, p-value=.001). The patients who had MetS were three times more likely to be physically inactive compared to their non-MetS counterparts.[Table 3]

Table 3. *Predictors of MetS among the cases.*

Variables	Odd ratio (OR)	95% Confidence interval Lower	upper	P-value
Age(years)				
<40	1.0			
≥40	2.05	0.86	11.01	.015*
Sex				
Male	1.0			
Female	1.72	0.50	10.17	.064
Family history of hypertension				
No	1.0			
Yes	1.93	0.78	12.60	.070
Physical activity				
Active	1.0			
Inactive	3.09	1.81	10.06	.001*

*=S

5. Discussion

The prevalence of MetS of 38.6% in this study is higher than that reported in Enugu, South-east Nigeria(15.9%)[20], Abuja, North-central Nigeria(14.9%)[21], Ghana(35.9%)[18] and other parts of the world like India(29.7%).[17] and Turkey(34.6%)[41] However, the prevalence of MetS of in this study is lower than that reported in Ethiopia(43.3%)[19] and Saudi Arabia(39.3%)[16]. The finding of this study has demonstrated that MetS is no longer the exclusive disease of affluent countries and occurs in proportion among the study population as an important component of non-communicable disease burden in Nigeria.[14] The magnitude of this burden of MetS among the study population is clinically relevant and informative especially in an environment where hospital attendance are largely driven by the need for curative services rather than the imperative for preventive care. The reported prevalence of MetS in this study could be a reflection of the changing lifestyle of the study population who were public servants in an urban geographic construct which is favourable to the onset and perpetuating of MetS. Since Nigeria has fewer resources to manage MetS and its complications, the most effective primary care intervention is early diagnosis and treatment. The interventions should include effective partnership between the patients and committed team of health professionals depending on the clustered elements of MetS in the individual. Educating these patients on the relevance of MetS, its risk factors and its interpretations should be integrated as part of patient health education and counselling during clinical encounter in primary care settings. It is therefore relevant to identify primary and secondary preventive strategies that have benefit-to risk and benefit-to cost ratio of any therapeutic interventions for MetS. These preventive interventions should be inexpensive, widely available, feasible and culturally friendly.

The prevalence of MetS was significantly associated with old age ≥40 years. The old adults aged ≥40 years were significantly affected compared to the young adults. This is in consonance with the reports that age is epidemiologically established non-modifiable and constitutional risk factor for the defining elements of MetS[16,17,22] According to these reports, the prevalence of MetS as defined by IDF criteria increases with age suggesting that age is related to each of the component of MetS. [16,17,22] Despite the age-related metabolic changes that predispose to MetS, knowledge of these subtleties is vital in primary care settings and maintaining high index of suspicion is advocated. This appears to be the only way old adult Nigerian public servants will benefit from reduction in specific and all cause mortality from MetS-related unnecessary deaths. The high prevalence of MetS among this age group paints a gloomy picture in the Nigerian labour force as this age group constitutes the most economically productive years who are expected to take active manpower duties and responsibilities in the country. Screening old adults' ≥40 years for MetS in NHIS clinics should be integrated as part of comprehensive health care protocol for MetS in primary care.

The prevalence of MetS was significantly higher among females compared to their male counterparts (p=). This finding is similar to reports from Nigeria,[7,21] and other

parts of the world such as Ghana[18] India[17] and turkey[41]. The higher prevalence of MetS among the females in this study could be a reflection of IDF cut off criteria which is lower for females than males in Nigeria.[4,14] Apart from the diagnostic criteria, the genetic and lifestyle-related differences between the sexes may be contributory.

The family history of hypertension was significantly associated with MetS. This could be a reflection that hypertension which is a component of MetS as the most common non-communicable disease in Nigeria[35] and tends to cluster in persons with family history of hypertension.[39,42-44] The emergence of hypertension-related MetS is therefore a reflection of not only genetic predisposition but also susceptibility and interactions between genetic and behavio-environmental factors. [42--44] Although not every patient with family history of hypertension is at risk of developing hypertension-related MetS but their chances are higher. Screening adult patients with family history of hypertension for MetS needs to be at initial clinical encounter as the development and damage by hypertension-related dysmetabolism start even before the diagnosis is made. Due to this constitutional genetic predisposition and clustering of hypertension-related MetS in families, the family history of hypertension should therefore inform the need to evaluate for hypertension and other components of MetS in order to identify covert and overt cases requiring management. The earlier the primary prevention starts the more likely it is to be beneficial.

This study has shown that MetS was significantly higher in the subjects who were physically inactive. Physical inactivity was reported as an important risk factor for chronic diseases among civil servants in Abakiliki, South-east Nigeria[45] and in other parts of world such as Ghana[46] and Thai[47]. Although physical inactivity is a global health problem but it occurs disproportionately higher in Nigeria which is a nation in socio-economic and demographic and epidemiological transition. The relevance of physical inactivity as a modifiable risk factor for non-communicable diseases such as hypertension, obesity, type 2 diabetes mellitus and dyslipidaemia has been reported by previous studies[36,39,40] and identified by World Health Organization. [48] Physical inactivity is associated with each of the principal defining criteria that contributes to MetS.[49-52] The physio-biological mechanism responsible for the beneficial effects of physical activity has been documented to include reduction of blood pressure, increase insulin sensitivity, elevation of HDL-cholesterol, reduction of atherogenic cytokine production and improve endothelial function.[6,49] The primary care clinicians should therefore explore the levels of physical activity the patients can accomplish because any physical activity is better than none. This information should not only be limited to the consequences of physical inactivity but also the benefits of physical activity in the overall metabolism and diverse medical conditions.

This study has shown that physical inactivity is the most significant predictor variable of MetS. This finding is consistent with other reports on the relevance of physical inactivity as an important risk factor for metabolic syndrome.[49-52] The finding of this study is very important especially in Nigerian socio-cultural environment where work and leisure-related physical activities and short distance communal trekking is perceived as an indication of suffering and poverty.[39,53] More worrisome in the study area is the role of modernization of means of transportation and communication such as the use of vehicular transport system and mobile cellular communication network.[53] These technologies probably have reduced short and long distance trekking and cycling time which involve energy expenditure. Due to change in family and societal dynamics, there is reduction in domestic, leisure and other societal-related physical activity. Although not every physically inactive patient develops MetS but their chances are higher. The addition of physical inactivity risk factor in patients with MetS needs further attention in primary care clinic in resource-constrained setting. Identifying this problem during clinical encounter therefore avails greater opportunity for health education, health promotion, health maintenance and risk reduction. Patients who have been physically inactive should be encouraged to start physical activity as part of their daily routine.

5.1. Implications of the Study

MetS has been the subject of recent research among different populations in Nigeria and adult Nigerian public servants attending NHIS primary care clinic are not spared and this carry great concern for safeguarding the health of the public work force in the study area. As Nigeria develops and adopts western culture, she also accumulates diseases associated with socio-economic and technological development like MetS. MetS can therefore compromise health status of Nigerian public labour force with morbidity and mortality costs. Given the inadequacy of distribution, determinants and deterrents interventions for MetS in the study area, the most effective physician intervention is through primary and secondary prevention. This study therefore has implications for primary care oriented and driven interventions for MetS among the Nigerian public human resources in the study area.

5.2. Limitations of the Study

The limitations of this study are recognized by the authors. First and foremost, the sample for the study was drawn from patients accessing care from primary NHIS clinic of the hospital. Hence, the findings of this study may not be general conclusions regarding patients from other NHIS outpatient clinics of the hospital. Thus external generalization of the findings of this study to other primary care NHIS clinic of other tertiary hospitals in Nigeria should be done with caution

In addition, this study was dependent on self-reported

behavioural factors and family history of component defining criteria for MetS in the first, second and third degree relatives. However, some respondents were either reluctant to give correct information regarding family history of hypertension, diabetes mellitus, abdominal obesity and/or stroke. Some respondents were not sure whether their relatives were afflicted by the cardio-metabolic disease or not. This could have led to response acquiescence, social desirable response and recall bias. In order to minimize recall biases the questions were structured in a manner that will enable the researcher obtain information relevant to the objectives of the study. This objectivity was also maintained by not fielding misleading questions. The researchers ensured that questions were not ambiguous or presented to the respondents in such a way as to communicate different meanings that could generate inaccurate and inconsistent responses.

Furthermore, the assessment for the behavioural risk factors of alcohol consumption, tobacco use and diets were not quantitative as regards the metabolic relevance of occasional or rarely use of alcohol or tobacco or consumption of dietary fruits and vegetables which may not predispose to MetS.

6. Conclusion

This study has shown that MetS exist among the study population and was significantly associated with old age ≥40 years, female sex, family history of hypertension and physical inactivity. The most significant predictor variable was physical inactivity. NHIS patients in the primary care clinic should be the focus of primary and secondary preventive interventions for MetS.

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