

Prevalence of Metabolic Syndrome among Students of Faculty of Health Science and Technology in Ebonyi State University, Abakaliki, Nigeria

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ABSTRACT- *Metabolic impairments could be seen at any point in human development. Although emphasis has been placed on older adults but it could be encountered in any age brackets. The aim of this study was to compare prevalence rates using different definitions of Metabolic syndrome (MetS) among students of Faculty of Health Sciences and Technology (FHST) in Ebonyi State University (EBSU), Abakaliki. This was a cross-sectional study involving 80 students (28 male students and 52 female students) recruited from among students of FHST in EBSU, Abakaliki, Ebonyi State, Nigeria. MetS was defined in three different ways [by International Diabetes Federation (IDF), National Cholesterol Education Program—Adult Treatment Panel III (NCEP-ATPIII), or World Health Organization (WHO) criteria]. Prevalence was found to be 6.3%, 2.5% and 7.5% using NCEP-ATP III, WHO, and IDF definitions respectively. The most common MetS components among female students using the NCEP-ATP III criteria were high blood pressure (5.8%) and abdominal obesity (5.8%), whilst low HDL-C concentrations, high blood pressure and abdominal obesity were most common among male students (7.1 % for each component mentioned). According to WHO, abdominal obesity (7.1%) and hyperglycaemia (7.1%) were the most common MetS components among male students. The most common MetS components among participants using the IDF criteria were abdominal obesity and high blood pressure. While some participants did not meet the MetS criteria of the NCEP-ATP III, WHO and IDF criteria (50%), many had one (30%) or two (13.8%) components and may be at risk of developing the syndrome in the future. The mean values of the risk factors used as criteria for the diagnosis of MetS were relatively normal in the study population thereby masking the presence of MetS, thus showing that the prevalence of MetS may gradually increase undetected unless individual members of the study population are subjected to laboratory investigation using different criteria for diagnosis of MetS. Therefore, traditional risk factors might be late markers for diagnosis of MetS since findings from this study showed that MetS was only detected in participants that already had it.*

Keywords— Prevalence, Metabolic Syndrome, Blood pressure, Obesity

1. INTRODUCTION

Metabolic syndrome (MetS) is a global health problem currently occupying the front burner in clinical and public health practice [1]. It is a cluster of biochemical and anthropometric abnormality that has high predictive ability for the development of atherosclerotic cardiovascular diseases and type two diabetes mellitus (T2DM) [2] and has been variously defined with sets of convergent and divergent diagnostic criteria which vary in specific principal elements but generally include hypertension (HTN), obesity, glucose intolerance, hypertriglyceridaemia and reduced high density lipoprotein-cholesterol (HDL-C)-dyslipidaemia. [3]

Several studies have shown that the variability of MetS syndrome within and across the world populations manifest as a consequence of actions and interactions of genetic, [4] and non-genetic (socio-environmental) factors. The predominant underlying risk factors of MetS appear to be insulin resistance and abdominal obesity. The associated clinical conditions include physical inactivity, sedentary lifestyle [5,6] and other enhancing risk factors such as cigarette smoking and heavy alcohol consumption.

Biological and socio-behavioural variations exist in the prevalence of metabolic syndrome (MetS). As the case detection of MetS increases in Nigeria, describing its prevalence and risk factors remain relevant for proactive control interventions.

Between 1998 and 2005, a number of definitions of the metabolic syndrome (MetS) have been proposed. This study was therefore set to compare prevalence rates of different definitions of MetS among students of faculty of health science and technology (FHST) in Ebonyi state university (EBSU), Abakaliki.

The prevalence of MetS has risen globally in the past 2 decades. [3,7] This trend is expected to continue predominantly in developing countries if no control interventions are put in place. [8] The prevalence of metabolic syndrome differs by definitions and diagnostic criteria across different parts of the world population. In United States of America the prevalence varies from 16% of black men to 37% of Hispanic women [5], prevalence of 39.3% was reported in Saudi Arabia [9], 29.7% was reported in India, [10] 43.3% was reported in Ethiopia,[11] 35.9% was reported in Ghana,[12] 15.9% was reported in South eastern Nigeria [13] and 14.9% was reported in Abuja, North central Nigeria.[15] The prevalence of metabolic syndrome has also been reported in specific high risk patients such as those with T2DM, [4,15,16,17], hypertensive patients [18] and obese patients [19]. Among the patients with T2DM, the prevalence of metabolic syndrome of 77.2% was reported in diabetics in India. [20], 66.7% was reported in diabetics in Eastern Nigeria, [17] 25.2% was reported in diabetics in Western Nigeria [15] and 54.3% was reported in Northern Nigeria. [16] In hypertensive patients' prevalence of 15.9% was reported in South-eastern Nigeria [13] and prevalence of 42.9% was reported in Western Nigeria. [21] Whilst in obese patients, prevalence of 46.3% was reported in Qatar, [18] 40.2% was reported in Malaysia [22] and 53.0% was reported in Italy [19].

It is a known fact that chances of developing CVD in individuals with MetS is greatly increased when compared to the normal population independently of the diagnostic criteria used. Overall a range of 1.5-3.0 times greater risk of CVD and CHD mortality has been found in several prospective studies whereas a recent meta-analysis documented a twofold increase in cardiovascular outcomes and a 1.5-fold increase in all-cause mortality in individuals with MetS [23]. The ability of MetS to predict risk for T2DM has been extensively studied and it is well accepted that the presence of MetS not only increases this risk, but is also highly predictive of new-onset T2DM [24]. In fact, MetS is associated with an approximately five times higher risk for incident T2DM [6].

2. MATERIALS AND METHODS

2.1 Study Population

The study population was made up of 80 adult students aged between 18 years and above were screened for MetS using WHO, IDF and NCEP: ATP III criteria.

2.2 Study Design and Setting

This was a cross-sectional study conducted at college of health science (CHS) popularly known as Presco campus Abakaliki, during the months of July 2016 and August 2016. Study participants were current students of the faculty of health science and technology (FHST), Ebonyi State University (EBSU) in Abakaliki during the 2015-2016 academic sessions. Participants were selected based on their relatively high stability and willingness to participate in the study during the 2015-2016 academic sessions.

2.3 Data Collection and Variable Specification

The data collection exercise were carried in two phases; on day one, participant's physical/anthropometric measurements were taken and were asked to return the following day (day two) for the collection of fasting blood samples for the biochemical investigation during morning hours (7:30 a.m.-11.30. a.m.). The biochemical investigation were carried out on the day two of each data collection exercise after collection of fasting blood sample had ended with the assistance of three (3) medical laboratory scientists at the chemical pathology laboratory, phase 2 of federal teaching hospital (FETHA 2) Abakaliki, Ebonyi State. Blood samples were collected after a 12-hour overnight fasting. Samples of 7 mL of blood were obtained from each participant employing standard infection prevention procedures. These samples were collected with the aid of an experienced nurse. The collected aliquots of blood serum were used to determine participants' fasting glucose concentrations and lipid profiles. Serum triglycerides (TGs), total cholesterol (TC), high-density lipoprotein cholesterol (HDL-C), low density lipoprotein cholesterol (LDL-C), and fasting serum glucose (FG) were measured with the assistance of three (3) medical laboratory scientists (using *Erba Mannheim Chem7* semi-auto analyzer spectrophotometer) at chemical pathology laboratory, phase 2 of federal teaching hospital (FETHA 2) Abakaliki, Ebonyi State. Lipid profile was determined by standardised enzymatic procedures using cholesterol assays. Participants' FG was determined using standardized glucose oxidase method. All laboratory assays were carried out using Randox reagents and test kits. Also all laboratory assays were completed without knowledge of participants' medical history. Lipid profile and FG concentrations were reported as mmol/l.

2.4 Sampling Technique

A multistage, stratified sampling strategy was used to identify and recruit participants. Students were selected from the various classes/levels in the two departments (Department Of Medical Laboratory Science And Nursing Sciences) that made up the faculty. Students were approached during school hours and were invited to participate in the study, and the final sample size included 28 male and 52 female students giving a total of 80 participants.

2.5 Physical/Anthropometric measurements

Blood pressure (BP) was measured using a digital measuring device (*Microlife BP A50, Microlife AG, Switzerland*) with participants sitting after resting for at least five minutes. Three BP measurements were taken with at least three minute intervals between consecutive measurements. The mean systolic and diastolic BP from the second and third measurements was analysed [25]. The weights of the participants measured using a scale. Height and weight were measured with participants wearing light clothing. Waist circumference was taken at the midpoint between the lower margin of the last palpable rib and the top of the iliac crest (hip bone) [25]. Hip circumference was taken around the maximum circumference of the buttocks [25]. Body Mass Index (BMI) was used to measure overweight and obesity and was also used to determine abdominal obesity when BMI of participants exceeded 30 kg/m². BMI is calculated by the

using the formula; $\frac{\text{Weight}}{\text{Height}^2}$ (kg/m²).

2.6 Ethical Consideration and informed consent

Ethical certificate was obtained from the Health Research and Ethics Committee of Ebonyi State University. Informed consent was also obtained from participants used in the study.

2.7 Biochemical investigations

2.7.1 Estimation of Total Cholesterol (TC)

Principle: The cholesterol is determined after the enzymatic hydrolysis and oxidation. The indicator quinoneimine is formed by hydrogen peroxide and 4-aminoantipyrine in the presence of phenol and peroxidase.

Procedure: Using a micropipette, 10 µl of distilled water, 10 µl of the standard and 10 µl of the test sample was added to the test tubes designated (properly labelled test tubes) for the reagent blank, standard and test sample respectively. 1000 µl of reagent was added to each of the three (3) test tubes mentioned above. After which these test tubes were mixed respectively and incubated for 10 minutes at 20-25°C. After incubation, small volumes of the reagent blank, standard and test sample were transferred into the cuvettes respectively. The concentration of the test sample was read against the reagent blank at 500 nm wavelength.

2.7.2 Estimation of Triglycerides (TGs)

Method: Colorimetric method

Principle: The triglycerides are determined after the enzymatic hydrolysis with lipase. The indicator quinoneimine is formed by hydrogen peroxide, 4-aminophenazone and 4-chlorophenol under the catalytic influence of peroxidase.

Procedure: Using a micropipette, 10 µl of the standard and 10 µl of the test sample were added to the test tubes designated for the standard and test sample respectively. 1000 µl of the reagent were added each to the two (2) test tubes mentioned above and also to the test tube designated for the reagent blank. After which these test tubes were mixed respectively and incubated for 10 minutes at 20-25°C. After incubation, small volumes of the reagent blank and test sample were transferred into the cuvettes respectively. The concentration of the test sample was read against the reagent blank at 500 nm wavelength.

2.7.3 Estimation of HDL-Cholesterol (HDL)

Principle: Low density lipoproteins (LDL and VLDL) and chylomicron fraction are precipitated out quantitatively by the addition of phosphotungstic acid in the presence of magnesium ions. After centrifugation, the cholesterol concentration in the HDL fraction, which remains in the supernatant, is determined.

Procedure: The procedure for analysing HDL-Cholesterol was made up of two stages- the first stage involved precipitation while the second stage did not.

Stage I-Precipitation: Using a micropipette, 200 µl of the standard and 200 µl of the test sample were added into the centrifuge tubes designated for the standard and test sample respectively. 500 µl of diluted precipitant (RI) were added to the two (2) centrifuge tube mentioned above. After which these centrifuge tubes were mixed respectively and allowed to sit for 10 minutes at room temperature. Then the test sample and standard were centrifuged for 10 minutes at 3000 rpm. After centrifuging the clear supernatant was separated using a micropipette.

Stage II-Colorimetric: Using a micropipette, 100 µl of distilled water, 100 µl of the standard and 100 µl of the supernatant were added to the test tubes designated (properly labelled test tubes) for the reagent blank, standard and test sample respectively. 1000 µl of reagent was added to each of the three (3) test tubes mentioned above. After which these test tubes were mixed respectively and incubated for 10 minutes at 20-25°C. After incubation, small volumes of the

reagent blank, standard and test sample were transferred into the cuvettes respectively. The concentration of the test sample was read against the reagent blank at 500 nm wavelength.

2.7.4 Estimation of Blood Glucose level

Glucose Oxidase Enzymatic Method

Principle: Glucose is determined after enzymatic oxidation in the presence of glucose oxidase. The hydrogen peroxide formed reacts, under catalysis of peroxidase, with phenol and 4-aminophenazone to form red-violet quinoneimine.

Procedure: Using a micropipette, 10 μ l of the standard and 10 μ l of the test sample were added to the test tubes designated for the standard and test sample respectively. 1000 μ l of the reagent were added each to the two (2) test tubes mentioned above and also to the test tube designated for the reagent blank. After which these test tubes were mixed respectively and incubated for 10 minutes at 20-25°C. After incubation, small volumes of the reagent blank, standard and test sample were transferred into the cuvettes respectively. The concentration of the test sample was read against the reagent blank at 500 nm wavelength.

2.8 Diagnostic Criteria for Metabolic Syndrome Using WHO, NCEP: ATP III AND IDF criteria

Prevalence of MetS was defined according to WHO NCEP: ATP III AND IDF criteria outlined below:

-World Health Organization criteria [26] Insulin resistance is defined as type 2 diabetes mellitus (DM) or impaired fasting glucose (IFG) (> 100 mg/dl or 5.6 mmol/l) or impaired glucose tolerance (IGT), plus two of the following: (1) Abdominal obesity (waist-to-hip ratio >0.9 in men or > 0.85 in women, or body mass index (BMI) > 30 kg/m²; (2) Triglycerides 150 mg/dl (1.7 mmol/l) or greater, and/or high-density lipoprotein (HDL)-cholesterol < 40 mg/dl (1.03 mmol/l) in men and < 50 mg/dl (1.29 mmol/l) in women; (3) Blood pressure (BP) $140/90$ mmHg or greater; (4) Microalbuminuria (urinary albumin secretion rate 20 μ g/min or greater, or albumin-to-creatinine ratio 30 mg/g or greater).

-National Cholesterol Education Program Adult Treatment Panel III (NCEP: ATP III) criteria [NCEP: ATP III 2001] Any three or more of the following: (1) Waist circumference > 102 cm in men, > 88 cm in women; (2) Triglycerides 150 mg/dl (1.7 mmol/l) or greater; (3) HDL-cholesterol < 40 mg/dl (1.03 mmol/l) in men and < 50 mg/dl (1.29 mmol/l) in women; (4) BP $130/85$ mmHg or greater; (5) Fasting glucose 110 mg/dl* or greater.

* In 2003, the American Diabetes Association (ADA) changed the criteria for IFG tolerance from 110 mg/dl to 100 mg/dl (5.6 mmol/l).

-International Diabetes Federation (IDF) criteria [27] Central obesity (defined as waist circumference but can be assumed if BMI > 30 kg/m²) with ethnicity-specific values,* plus two of the following: (1) Triglycerides 150 mg/dl (1.7 mmol/l) or greater; (2) HDL-cholesterol < 40 mg/dl (1.03 mmol/l) in men and < 50 mg/dl (1.29 mmol/l) in women; (3) BP $130/85$ mmHg or greater (4) Fasting glucose 100 mg/dl (5.6 mmol/l) or greater.

*To meet the criteria, waist circumference must be: for Europeans, > 94 cm in men and > 80 cm in women; and for South Asians, Chinese, and Japanese, > 90 cm in men and > 80 cm in women. For ethnic South and Central Americans, South Asian data are used, and for sub-Saharan Africans and Eastern Mediterranean and Middle East (Arab) populations, European data are used.

2.9 Statistical methods

SPSS (version 20.0) was used for all statistical analyses. Student's *t*-tests and analysis of variance (ANOVA) were used to evaluate differences in mean for study groups. Continuous variables were expressed as mean \pm standard deviation. Chi square was used to evaluate the difference in mean categorical variables. The prevalence estimates for MetS according to the three definitions were determined separately (WHO, IDF, NCEP-ATP III). Using previously described methods, 95% confidence intervals for prevalence estimates were determined [28]. All reported *P* values are two tailed, and statistical significance was set at 0.05 levels.

3. RESULTS

Anthropometric and biochemical findings

The study consisted of 80 participants (28 males [35%] and 52 [65%] females) with mean age 24.4 ± 5.87 years old. The mean age for the male was 24.96 ± 6.76 years, while the mean age for the female was 24.21 ± 5.39 years. Table 1 shows the baseline and clinical characteristics of the study population. Approximately, a quarter of male students (28.6%) and female students (25.0%) were overweight (BMI 25.0 – 29.9 kg/m²). Females were more likely to be obese (25.0%) compared to males (14%). The mean systolic blood pressure (sBP) and diastolic blood pressure (dBP) were higher for male students (128.67 ± 14.5 mmHg and 79.64 ± 11.9 mmHg respectively) than for female students (117.19 ± 13.25 mmHg and 73.52 ± 10.50 mmHg respectively). Male students also had a slightly higher mean WHR (0.84 ± 0.04) compared with the females (0.81 ± 0.06) while waist circumference and fasting serum glucose concentrations were similar for both groups respectively. However, mean serum HDL-C concentrations were higher among female students (1.72 ± 0.59) as compared with male students (1.46 ± 0.48). The mean serum triglyceride concentrations were higher, among males (0.98 ± 0.81) as compared with females (0.70 ± 0.33). It was observed that there was a significant difference between sexes for the following variables: sBP ($P=0.000$), dBP ($P=0.040$), HDL-C ($P=0.036$) and WHR ($P=0.003$).

Table 1: Anthropometric and biochemical characteristics of participants and differences by gender

Characteristics	Gender			P- value ^a
	Total (n=80)	Male students (n=28)	Female students (n=52)	
	(%)	(%)	(%)	
BMI (kg/m ²)				
Underweight (<18.5)	1.3		1.9	0.000 ^b
Normal (18.5-24.9)	26.3	57.1	48.1	
Overweight (25.0-29.9)	51.3	28.6	25.0	
Obese (≥30.0)	21.3	14.3	25.0	
	Mean (SD)	Mean (SD)	Mean (SD)	
Age	24.48±5.87	24.96±6.76	24.21±5.39	0.588
Glucose (mmol/l)	4.13±0.63	4.15±0.75	4.12±0.56	0.827
Systolic blood pressure (mmHg)	121.21±13.90	128.67±14.45	117.19±11.89	0.000
Diastolic blood pressure (mmHg)	75.66±11.83	79.64±13.25	73.52±10.50	0.040
Triglycerides (mmol/l)	0.80±0.56	0.98± 0.81	0.70±0.33	0.091
High-density lipoprotein (mmol/l)	1.63±0.57	1.46±0.48	1.72±0.59	0.036
Waist circumference (cm)	79.94±11.24	79.89±9.88	79.96±12.00	0.978
Waist-Hip Ratio (WHR)	0.82±0.06	0.84±0.04	0.81±0.06	0.003
MetS by ATP III criteria	1.06±0.24	1.07±0.26	1.06±0.24	0.809 ^c
MetS by WHO criteria	1.03±0.16	1.07±0.26	1.00±0.00	0.051 ^c
MetS by IDF criteria	1.06±0.27	1.10±0.32	1.06±0.24	0.423 ^c

Abbreviations: BMI, body mass index; HDL-C, high-density lipoprotein cholesterol; WHO, World Health Organisation; IDF, International Diabetes Federation; NCEP-ATP III, National Cholesterol Education Program—Adult Treatment Panel III

^aDifferences determined by using 2-tailed *t* tests following Levene’s test for equality of variances.

^bDifferences determined by using ANOVA

^cDifferences determined by using *X*²

Table 2: Prevalence of metabolic syndrome components by gender according to NCEP-ATP III, WHO and IDF criteria.

Gender	NCEP-ATP III		WHO		IDF	
	Male	Female	Male	Female	Male	Female
<i>N</i>	28	52	28	52	28	52
MetS criteria:						
Hypertension, <i>n</i> (%)	7.1	5.8	3.6		10.7	5.8
Hyperglycaemia, <i>n</i> (%)			7.1		3.6	
Low HDL cholesterol, <i>n</i> (%)	7.1	1.9			7.1	1.9
Hypertriglyceridaemia, <i>n</i> (%)	3.6	3.8			3.6	3.8
Body mass index > 30 kg/m ² , <i>n</i> (%)			3.6		7.1	9.6
Waist circumference, <i>n</i> (%)	7.1	5.8			10.7	5.8
Waist-to-Hip ratio, <i>n</i> (%)			7.1			

WHO, World Health Organization; IDF, International Diabetes Federation;
NCEP-ATP III, National Cholesterol Education Program—Adult Treatment Panel III

Table 2 shows the prevalence of MetS components by gender according to NCEP-ATP III, WHO and IDF criteria. The most common MetS components among female students using the NCEP-ATP III criteria were high blood pressure (5.8%) and abdominal obesity (5.8%), whilst reduced HDL-C concentrations, high blood pressure and abdominal obesity were most common among male students (at 7.1 % for each component mentioned). According to WHO, abdominal obesity (7.1%) and hyperglycaemia (7.1%) were the most common MetS components among male students. The most common MetS components among participants using the IDF criteria were abdominal obesity and high blood pressure. While some participants did not meet the MetS criteria of the NCEP-ATP III, WHO and IDF criteria (50%), many had one (30%) or two (13.8%) components and may be at risk of developing the syndrome in the future.

Table 3: Prevalence of MetS according to three definitions (NCEP-ATPIII, WHO and IDF)

	NCEP-ATPIII		WHO		IDF	
<i>N</i>	80		80		80	
MetS Yes:	5		2		6	
MetS No:	75		78		74	
Percentage, <i>n</i> (%)	6.3		2.5		7.5	
Gender	Male	Female	Male	Female	Male	Female
<i>N</i>	28	52	28	52	28	52
MetS Yes:	2	3	2	0	3	3
MetS No:	26	49	26	52	25	48
Percentage, <i>n</i> (%)	7.1	5.8	7.1	0	10.7	5.8

WHO, World Health Organisation; IDF, International Diabetes Federation; NCEP-ATPIII, National Cholesterol Education Program—Adult Treatment Panel III

Table 3 shows the prevalence of MetS as defined using the NCEP-ATP III, WHO and IDF diagnostic criteria. Using the NCEP-ATP III definition, the prevalence of MetS was 6.3 % overall (7.1 % among male students and 5.8% among female students) in the study population, 2.5 % according to WHO definition (7.1 % among male students) and application of the IDF definition in this study population yielded a MetS prevalence of 7.5% overall (10.7% of male students and 5.8% of female students).

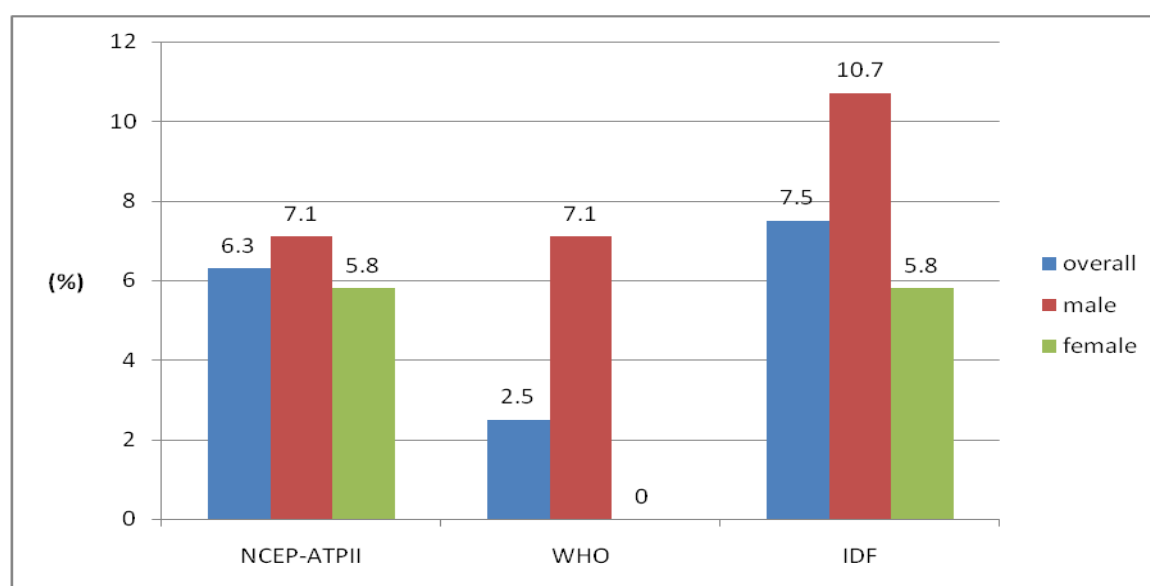


Figure 1: Prevalence of MetS according to three definitions (NCEP-ATPIII, WHO and IDF)

The anthropometric and biochemical Characteristics of participants fulfilling the three definitions (NCEP-ATPIII, WHO, IDF) of MetS are shown in Table 1. All risk factors were almost significantly different ($P<0.05$) when comparing those with and without MetS. Young adults who were classified as having MetS had a significantly higher BMI, waist circumference, triglycerides, systolic blood pressure and diastolic blood pressure, and lower HDL-C than those who were negative for MetS.

4. DISCUSSION

Findings from this study confirm a low prevalence of MetS among students of FHST in EBSU, Ebonyi State, Nigeria. Using the NCEP-ATP III definition, the prevalence of MetS was found to be 6.3%, using WHO definition it was 2.5% while the IDF criteria yielded an even higher prevalence of 7.5% (Figure 1). Results from the study suggest that male students were at greater risk for MetS (NCEP-ATP III 7.1%, WHO 7.1 and IDF 10.5%) than female students (NCEP-ATP III 5.8% and IDF 5.8%). These prevalence rates are lower than 20-25% estimated for adults population globally by IDF [29]; 28.1% reported using IDF criteria in a systematic review of published studies in adult Nigerians [30] and 35% reported among healthy elderly South-western Nigerians. [31] The prevalence of MetS increased markedly with age and was most prevalent among participants with BMI ≥ 30 kg/m² (male, 14.3% and females, 25%). This is attributed to the fact that ageing is associated with emergence of insulin resistance, diversion of fat from peripheral to the central sites with progressive redistribution of the fat stores more to the intra-abdominal visceral region. [31] In addition, neuro-hormonal alterations associated with ageing can predispose, promote and enhance mechanistic pathogenesis of MetS. [32]

Lastly, the number of participants with one (30%) or two (13.8%) MetS components suggest that certain individuals are potentially at risk of developing the syndrome. Little information exists concerning the prevalence and epidemiological characteristics of MetS in sub-Saharan Africa especially in young adults. The first reported MetS study in the region was conducted in the mid-90s in Cameroon [33] which found a 1.5% and 1.3% prevalence of MetS among urban dwelling women and men using IDF criteria [8]; however, the study did not measure HDL-C concentrations. A second study conducted in 2004 by [34] in Seychelles, found a high prevalence of MetS where 25%–30% of their study population had the syndrome. A community based study conducted in Tanzania in 2009 reported a 38% prevalence of MetS although the study sample size was small [35]. In Nigeria, a study involving adults in semi-urban and rural communities found a prevalence of MetS to be 18% [13], [36] in their study among rural Nigerians reported a 12.1% prevalence of MetS, prevalence of 15.9% was reported in South eastern Nigeria [13] and 14.9% was reported in Abuja, North central Nigeria. [14]

The prevalence estimates of the present study population are lower than what was reported in Cameroon, rural Nigeria, Ethiopia, Ghana [8,12,36,37] Seychelles and Tanzania [38,39]. The study findings were lower than other reports of MetS prevalence of developed countries over the last few years including the USA [1], Portugal [40], Turkey [41], Saudi Arabia [9], and India. [10] Several other studies before now have also evaluated MetS prevalence using more than one definition including those established by NCEP-ATP III, WHO and IDF. [34,36].

Previous studies conducted in sub-Saharan Africa including in Benin and in south-western Nigeria have identified a high prevalence of cardiometabolic risk factors including abdominal obesity (32.0% and 14.7%, respectively) and HTN (23.0% and 28.0%, respectively) [42,43] whereas this present study identified 2.5% of the study population to be pre-diabetic and high prevalence of abdominal obesity (21.3%), HTN (18.8%), high TG (6.3%) and reduced HDL-C (23.8%). The Prevalence of 2.5% to 7.5% as seen in this study could be a reflection of the socioepidemiological characteristics of the study population (students) whom are young adults and still physically active. The current wave of epidemiological and nutritional transition that has occurred globally including in sub-Saharan African countries where lifestyle and behavioural changes, both products of modernization and urbanization, appears not to have taken place in the study population but preventative measures as well as interventional programs should be put in place as this epidemiological transition predispose to increased risk and incidence of CVD. [44]

The global prevalence of chronic non-communicable diseases (NCDs) is on the rise, with the majority of the growth occurring among populations in developing countries [45]. In sub-Saharan Africa, NCDs are projected to surpass infectious diseases by 2030 [46]. As young adult Nigerians adopt more western lifestyles, they also accumulate diseases associated with socio-technological and economic advancement such as metabolic syndrome and this carries great concern for safeguarding the health of the young adult Nigerians in general.

5. CONCLUSION

Prevalence of the MetS ranged from 2.5% to 7.5% and using the NCEP-ATP III definition, the prevalence of MetS was found to be 6.3%, using WHO definition it was 2.5% while the IDF criteria yielded 7.5%. Individually, some participants were identified as having MetS, but when the mean values of risk factors of the study population are taken into consideration, these participants, although obese, seem to be healthy. The number of participants with MetS may decrease once ethnic-specific cut-points have been developed.

The lipid profile of the study population were relatively normal since the mean TG (0.80±0.56) and HDL-C (1.63±0.57) of participants were within normal reference values whereas the fasting glucose levels of the study

population were also normal since the mean glucose levels (4.13 ± 0.63) of participants were within normal reference values. However, 2.5% of the study population was found to be pre-diabetic and the proportion with high TG (6.3%) and reduced HDL-C (23.8%) appears to be high.

The WHR and WC of the study population were normal since mean WHR (0.82 ± 0.06) and WC (79.93 ± 11.24) which were the anthropometric indices used to determine abdominal obesity was below the cut-off for required detecting abdominal obesity but mean BMI (25.67 ± 4.65) of the participants showed that majority of the study population was overweight. The sBP and dBP were also normal since the mean sBP (121.21 ± 13.90) and dBP (75.66 ± 11.83) were below the cut-off for MetS and also relatively normal. However, 18.8% were hypertensive and 21.3% abdominal obesity. The high prevalence of abdominal obesity supports the reasoning that it is an early step in the development of MetS and most of those diagnosed of MetS also had this risk factor. Individuals with and/or at risk of MetS ought to focus on weight management and engage in appropriate physical activity and energy consuming exercises.

The mean values of the risk factors (any three of abdominal obesity, hyperglycaemia, HTN, high TG and low HDL-C) used as criteria for the diagnosis of MetS were relatively normal in the study population thereby masking the presence of MetS, thus showing that the prevalence of MetS may gradually increase undetected unless individual members of the study population are subjected to laboratory investigation using different criteria for diagnosis of MetS. Therefore, traditional risk factors (abdominal obesity, hyperglycaemia, HTN, high TG and low HDL-C) might be late markers in diagnosis of MetS since findings from this study showed that MetS was only detected in participants that already had it. Moreover, future interventions by health policy makers and public health officials ought to focus on the individuals at risk for MetS who have one or two risk factors in order to control any potential burden of the syndrome.

6. REFERENCES

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