



*Full Length Research Paper*

# Prevalence and characteristics of metabolic syndrome among hypertensive patients attending a tertiary hospital in Kano, Nigeria

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## Abstract

Hypertension is the most common and important cardiovascular disease (CVD) risk factor, frequently clustering with other risk factors to increase cardiovascular disease morbidity and mortality. This study therefore, aimed to assess the prevalence of metabolic syndrome (MS) among hypertensive subjects using the criteria of the National Cholesterol Education Program's Adult Treatment Panel III (NCEP – ATP III) in a tertiary hospital, in Kano, North – Western Nigeria. This was a cross-sectional study conducted at the hypertensive clinic of Murtala Muhammad Specialist Hospital, Kano. Structured pre-tested interviewer administered questionnaire was used for data collection. A population of 240 hypertensive patients ( 119 males and 121 females) over the age of 18 years were screened for metabolic syndrome by determining the body mass index (BMI), waist circumference, levels of fasting plasma glucose and fasting plasma lipids. Out of the 240 patients studied, 92(38.2%) patients met the criteria for metabolic syndrome. 26(28.6%) of them were males and 66(71.4%) were females. Type II diabetes mellitus was found in 85(35.8%), impaired fasting glucose in 18(7.5%), high plasma triglycerides in 58(24.4%) and low high density lipoprotein cholesterol in 79(33%). Obesity was found in 105(43.8%). The prevalence of metabolic syndrome among hypertensives in Kano is high. Therefore, regular screening and control of hypertension and other CVD risk factors is necessary to prevent complications.

**Keywords:** Hypertensives, Metabolic syndrome, Kano, Nigeria.

## INTRODUCTION

Cardiovascular diseases (CVDs) remain the leading cause of death and disability worldwide, with over 80% of the deaths occurring in the low and middle income countries (WHO Global Report 2011). Although a large proportion of the deaths are preventable, they continue to rise mainly because preventive measures are inadequate. It has been projected that by the year 2030, about 23.6 million people will die from CVDs (WHO Global Report 2011). This is attributable to the worsening

CVD risks profiles in the developing countries as a result of epidemiologic transition (WHO Global Report 2011).

Metabolic syndrome is characterized by a constellation of CVD risk factors that are metabolic in origin that include arterogenic dyslipidemia, hypertension, obesity, dysglycaemia, insulin resistance and/ hyperinsulinaemia (Miranda et al., 2005). The diagnostic criteria for MS has been published by different Working Groups with modifications and revisions towards

finding a common ground (Albeti et al., 2009) These diagnostic criteria include World Health Organization (WHO) criteria, The European Group for the study of Insulin Resistance (EGIR) criteria, The American College of Endocrinology (ACE) criteria, the International Diabetes Federation (IDF) criteria and the Third Report of the National Cholesterol Education Programme Adult Treatment Panel (NCEP ATP) III criteria (Albeti et al., 2009; Grundy et al, 2004; Balkas and Charles 1999 et al, 2003; Grundy et al., 2005).

The most widely used clinic - based diagnostic criteria are those of the IDF and NCEP – ATP III. Using the NCEP – ATP III criteria, an individual is considered to have MS in the presence of three of the following clinical criteria. Blood pressure (BP)  $\geq$  130/85mmHg, waist circumference (WC)  $>$  102cm in men and  $>$  88cm in women, HDL cholesterol  $<$  1.0mmol/l (40mg/dl) in men and  $<$  1.3mmol/l (50mg/dl) in women, triglycerides (TG)  $\geq$  1.7mmol/L (150mg/dl) and FBG  $\geq$  5.6mmol/l (101mg/dl) Grundy et al., 2005).

The syndrome has generated much concern over the past few years because it clearly represents a high risk for developing coronary artery disease and cardiovascular events (Berner et al., 2006).

The aim of this study was to determine the prevalence of this high risk condition in a population of hypertensive patients attending a tertiary hospital in Kano, Nigeria.

## MATERIALS AND METHODS

The study was cross sectional carried out in Murtala Muhammad Specialist Hospital, Kano State, Nigeria. The study protocol was approved by the research and ethics committee of the hospital, before commencement of the study. The study population comprised of 240 hypertensive subjects (males 117; females 123) aged at least 18 years, attending the hypertensive clinic of the hospital. The patients were consecutively selected from the male and female hypertensive clinics and screened for the presence of metabolic syndrome from July to September, 2017.

Structured pre-tested interviewer administered questionnaire, which included personal data, history of type II diabetes mellitus, measurement of body mass index (BMI), waist circumference, fasting plasma glucose and fasting lipid profile (TG, total cholesterol, high – density lipoprotein cholesterol, HDL – C) was used for data collection.

The diagnosis of metabolic syndrome was based on the NCEP – ATP III criteria (Grundy et al., 2005). A patient was considered obese if BMI was  $\geq$  30Kg/m<sup>2</sup>, and a diagnosis of abdominal obesity was made when the waist circumference exceeded 102 cm (40 inches) in

males and 88cm(35 inches) in females (Daubresse et al., 2000). Dyslipidemia was defined using the National Cholesterol Education Programme – Adult Treatment Panel III (NCEP ATP III) guidelines (NCEP – ATP III, 2002). Hypercholesterolemia was diagnosed when total cholesterol (TC)  $\geq$ 200mg/dl (5.2mmol/L), hypertriglyceridemia when triglycerides (TG)  $\geq$  150mg/dl (3.38mmol/L) and low high density lipoprotein cholesterol (HDL-C)  $\leq$  40 mg/dl (1.0mmol/L) in men or if  $\leq$  50 mg/dl (1.2mmol/L) in women (NCEP – ATP III, 2002). DM and impaired fasting glucose was diagnosed in accordance with the American Diabetes Association guidelines (Report of the expert committee on the diagnosis and classification of Diabetes Mellitus, 2002).

All laboratory tests were done in the chemical pathology laboratory of Murtala Muhammad Specialist Hospital, using the auto-analyzer machine (Chiron Diagnostic- Bayer, England, 2009).

The statistical analysis was conducted using SPSS version 19 (Chicago, IL, USA). Continuous variables were presented as mean  $\pm$  standard deviation. Qualitative variables were expressed as proportions and percentages. The Chi-squared or Fisher's Exact tests were used to compare proportions, while Student's t-test was used to compare means. A P value  $<$  0.05 was considered significant.

## RESULTS

Of the 240 hypertensive patients, 92 (38.2%) met the ATP III criteria for the diagnosis of MS. This comprised of 66 males and 26 females giving prevalence of 71.4% and 28.6% respectively. The mean age of the patients was  $56 \pm 11.8$  years with a range of 24 to 90 years. Mean systolic and diastolic BP were  $151 \pm 12.8$ mmHg and  $90 \pm 14.6$ mmHg respectively. The clinical characteristics of the study population are as shown in Table 1. The prevalence of each of the five ATP III criteria for the diagnosis of MS is as shown in Table 2. The criteria with the highest prevalence were increased waist circumference 105 (43.8%) while the lowest was that of impaired fasting blood sugar 18(7.5%). Type II DM was however found in 85(35.8%). Low HDL – C was found in 79(33%), while high TG was found in 58(24.2%). In addition the prevalence abdominal obesity (increased waist circumference) and impaired fasting glucose were significantly higher in women compared to men ( $P = <$  0.05).

The prevalence of MS was highest in those aged 45 – 60 years and lowest for those aged less than 30 years. The prevalence of MS among different age groups with and without MS is shown in Table 3.

**Table 1:** Clinical characteristics of the hypertensive patients

Parameter	All patients	Male	Female	P - value
SBP(mmHg)	151±12.8	157±15.6	149±14.2	<0.001*
DBP(mmHg)	90±14.6	92±15.1	90±16.2	NS
FBG(mmol/L)	6.1±3.3	5.8±2.1	6.0±3.2	NS
HDL – C(mmol/L)	13.8±1.4	1.36±1.2	1.38±1.4	NS
TG(mmol/L)	1.72±0.83	1.70±0.6	1.74±0.8	NS
WC(cm)	94.6±12.9	92.2±10.9	97.9±12.6	0.001*

Key: \* P value statistically significant, NS; not significant, SBP; systolic blood pressure, DBP; diastolic blood pressure, FBG; fasting blood glucose, HDL – C; high density lipoprotein cholesterol, TG; triglycerides, WC; waist circumference.

**Table 2:** Prevalence of each of the criteria for diagnosis of metabolic syndrome among study population

Criteria	Total Subjects n(%)	Males n(%)	Females n(%)	P - value
Low HDL – C	79(33)	42(53.2)	37(46.8)	NS
Elevated TG	58(24.2)	28(48.3)	30(51.7)	NS
Increased WC	105(43.8)	38(36.2)	67(63.8)	<0.001*
Type II DM	85(35.8)	45(52.9)	40(47.1)	NS
Impaired FBG	18(7.5)	6(33.3)	12(66.7)	<0.001*

Key: \* P value statistically significant, NS; not significant, HDL – C; high density lipoprotein cholesterol, TG; triglycerides, WC; waist circumference, DM; diabetes mellitus, FBG; fasting blood glucose.

**Table 3:** Prevalence of metabolic syndrome by age

Age group	Total	With MS	Without MS
< 30	24	4	20
31 – 44	57	22	35
45 – 60	89	40	49
> 60	26	26	44
Total	240	92	148

Key: MS; metabolic syndrome.

## DISCUSSION

Hypertension frequently clusters with other CVD risk factors, thus increasing the risk for MS. The prevalence of MS of 38.2% in this study is consistent with previous reports in Nigeria and other parts of the world (Charles et al., 2012; Burstein and Mortin 1996; Ulasi et al., 2010; Kelishadi et al., 2005; Li et al., 2009; Sorhhou et al.,

2004; Mule et al., 2005). Much higher rates were however reported in Spain (52%), United States (62.9%) and Jordan (52%) (Barros et al., 2007; Ford et al., 2002; Yasein et al., 2010). The possible explanations for the variations may be explained by the genetic disparities, ethnic, socio demographic characteristics, lifestyle, duration of hypertension and experiences with treatment (Grundy et al., 2008; Misra et al., 2008; Saad

et al., 1991). Black Africans are known to have lower adipose tissue mass for same BMI than Caucasians (Deurenberg et al., 1998). The finding of significantly higher prevalence of MS among Caucasian and Hispanic men than in their Black counterparts in the Third United States National Health and Nutrition Evaluation Study (NHANES III), suggests ethnicity may be important in determining the rate of MS (Ford et al., 2002). In Abuja, Nigeria however, a lower rate of 16.8% was reported (Orji et al., 2012). The differences in the criteria used in diagnosis may partly explain the observed difference.

The prevalence of MS was higher among females, a finding consistent with several reports among different populations (Burstein et al., 1996; Ulasi et al., 2010; Yasein et al., 2010; Kelliny et al., 2008). The higher prevalence among women may be due higher prevalence of obesity among women, and also the relatively sedentary life style of women in this part of the world, from socio cultural barriers in which women do not engage in work related physical activities. A few studies however reported equal prevalence between gender and even a male preponderance, which may be probably, due to different methodologies (Alegria et al., 2005; Ohta et al., 2007; Badr et al., 2007; Abu et al., 2008; Fezeu et al., 2007).

Central obesity was the most prevalent component of MS present in the participants. This finding has been reported in previous studies (Ulasi et al., 2010; Kelliny et al., 2008; Fezeu et al., 2007). In addition, Fezeu et al, in Cameroon reported that central obesity was more highly associated with components of MS than was homeostasis model assessment for insulin resistance (HOMA – IR), and went further to conclude that central obesity was likely to be the key determinant of MS in sub Saharan Africa (Fezeu et al., 2007).

The prevalence of MS has been reported in numerous studies to increase with age (Ford et al., 2002; Morimoto et al., 2008; Yi et al., 2010). In the present study, prevalence of MS was higher among older adults aged  $\geq$  40 years. This is attributed to the fact that ageing is associated with emergence of insulin resistance and diversion of fat from peripheral to central sites (Boden et al., 1993). In addition, neurohormonal alterations associated with ageing can predispose, promote and enhance pathogenesis of MS. The age related loss of body fat may be responsible for the decline in MS rate among the oldest groups (Boden et al., 1993).

## CONCLUSION

Metabolic syndrome is highly prevalent among hypertensive subjects. The clustering of other CVD risk factors with hypertension makes them at risk of developing MS.

Therefore, these individuals should be routinely screened and have these risk factors corrected through initiation of lifestyle and other treatment measures, in order to prevent them from developing cardiovascular disease.

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