Nutritional Status and Prevalence of Metabolic Syndrome among Out-Patients attending Aminu Kano Teaching Hospital, Kano State, Nigeria

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ABSTRACT

Background: *Metabolic Syndrome (MetS) is a risk factor for increased cardiovascular mortality and morbidity. Excess energy intake and sedentary life style are clinical challenges in the wake of urbanization that increases obesity.*

Objective: *To assess the nutritional status and prevalence of Metabolic Syndrome among Out-patients attending Aminu Kano Teaching Hospital, Kano State.*

Methodology: *A cross-sectionalstudy involving 140out-patients of Aminu Kano Teaching Hospital, Kano State.Anthropometric measurements, assessment of risk factors of Mets and 24-hour dietary recall were obtained. Data were analyzed using descriptive and inferential statistical analysis.*

Results: *The study comprised (51.4% - male and (48.6% - female with (30%) in age of 21-30years. About (54%) had normal body mass index (BMI), (22%) overweight and (15%) obese. Prevalence of MetS was 14.3%. Risk factors of MetS revealed about 33% male patient at low risk against 22% female at high risk using waist hip ratio (WHR). Blood glucose level indicated (18%) diabetic and 27.9% at normal level. Almost 53% had normal blood pressure while 47% were hypertensive. Majority (80%) were at low risk based on total triglycerides and high-density lipoprotein. The relationship between risk factors of MetS and nutrient intake indicated significant relationship between BMI, WHR, nutrients while blood pressure had no significant association with nutrient intake at 0.05 level of significance.*

Conclusion: *MetS was observed among the out-patients especially females with abdominal obesity. The patients however exhibited good nutritional status based on body mass index.*

Keywords: Nutritional status, prevalence, metabolic syndrome, patients, teaching hospital

INTRODUCTION

Metabolic Syndrome (MetS) is defined by the presence of risk factors of high blood pressure, abdominal obesity, hypertriglyceridemia, low concentration of high-density lipoprotein (HDL-C) and hyperglycemia (1,2). It has become a major and escalating public health and clinical challenge worldwide in the wake of urbanization, surplus energy intake, increasing obesity and sedentary life habits (3).

Metabolic syndrome (MetS) is describes as a cluster of factors with a metabolic origin, such as obesity, hypertriglyceridemia, low HDL-cholesterol, arterial hypertension and glucose metabolism disorders, which are associated with cardiovascular diseases and type 2 diabetes mellitus (4). Now, it is well known that metabolic syndrome is a risk factor for increased cardiovascular mortality and morbidity. It has

been estimated that up to 80% of the 200million people with diabetes globally will die of cardiovascular diseases, thus putting metabolic syndrome and diabetes mellitus ahead of HIV/AIDS in terms of morbidity and mortality (5).

Metabolic susceptibility usually is required for the Metabolic syndrome to become evident (6).Susceptibility factors include adipose tissue disorders (typically manifest as abdominal obesity), genetic and racial factors, aging and endocrine disorders. Genetic aberrations affecting specific metabolic risk factors can further modify expression of the syndrome. The Metabolic syndrome is often associated with other medical conditions, notably, fatty liver, cholesterol gallstones, obstructive sleep apnea, gout, depression, musculoskeletal disease and polycystic ovarian syndrome (7).

Current definitions of metabolic syndrome vary and cardiovascular risk appears to differ according to which component risk factors present (8). Metabolic syndrome is a complex web of metabolic factors that are associated with a 2-fold risk of cardiovascular diseases (CVD) and a 5-fold risk of diabetes. Individuals with Metabolic syndrome have a 30% - 40% probability of developing diabetes and/or CVD within 20 years, depending on the number of components present (9). This is frightening as such an economic burden cannot be coped by most developing nations like ours (Nigeria). An important point about the metabolic syndrome is that it is not a substitute for global risk assessment in evaluating absolute risk of individuals for the purpose of initiating preventive drug therapy. Instead the Metabolic syndrome represents that part of global risk that can be attributed to underlying metabolic causes such as abnormal body fat distribution and obesity. Although the presence of the metabolic syndrome may influence choice of drug therapies, its presence essentially depicts the need to emphasize lifestyle management in clinical practice.

Metabolic syndrome (MetS) is a global health problem presently occupying the front burner in clinical and public health practice (3). Worldwide prevalence of MetS ranges from <10% to as much as 84% depending on the region-urban or rural environment, composition (sex, age, race and ethnicity) of the population studied and the definition of the syndrome used (10). Gyakobo *et al*(11), reported a metabolic syndrome prevalence of 35.9% in a rural population in Ghana. Among group of hypertensive Nigerians, the prevalence of metabolic syndrome was found to be 34.3% (ATP III), 35% (WHO) and 42.9% (IDF) (12).

In urban population across Nigeria, Ojji *et al*(13) reported a relatively low metabolic syndrome prevalence of 13.0% in Abuja, Siminialayi *et al*(14) reported a high metabolic syndrome prevalence of 35.4% in Rivers State while14% prevalence of metabolic syndrome was found among 91 respondents in Babcock University Teaching Hospital, Ilishan-Remo, Ogun State (15), however, reports from Lagos State showed the prevalence rate of metabolic syndrome as high as over 80% among diabetic patients (16). Furthermore, higher socio-economic status, sedentary lifestyle and high body mass index (BMI) were significantly associated with metabolic syndrome (17). This could be attributed to the fact that, nowadays, most adult individuals have abandoned physical activities and engage themselves in the habit of fast food consumption, inevitably consuming high energy dense food and drinks. This combination of unhealthy dietary habit and physical inactivity will place them at great risk of developing metabolic syndrome and its complications, in addition to late identification of metabolic syndrome as most Nigerians do not go for regular medical check unless they are ill. This study therefore assessed the Nutritional Status and Prevalence of Metabolic Syndrome among Out-patients in Aminu Kano Teaching Hospital in Kano State, Nigeria.

METHODOLOGY

Study design

The study is a cross-sectional hospital-based study. The study population comprised the Out-patients of Aminu Kano Teaching Hospital Kano, Kano State.

Area of Study

The study was carried out in Kano State. Kano State is one of the Northern States in Nigeria located in North Western Zone. It was created on May 27, 1967. It borders Katsina State to the North-West, Jigawa State to the North-East, Bauchi State to the South-East and Kaduna State to the South-West. Kano State has total population of 9,383,682 at 2006 census. The specific area of study was Aminu Kano Teaching Hospital. It was established in August, 1988 when the Kano State Government formally handed over the Hospital to the Federal Government to be used as a Teaching Hospital. The hospital temporarily started operation at Murtala Muhammad Specialist Hospital and moved to its permanent site in 1996. Today the hospital has grown to be a full 500 bedded Teaching hospital with some modern equipment and facilities providing health care delivery services for both in-patients and out-patients on daily basis.

Inclusive Criteria

The study involved only the Out-patient attending Aminu Kano Teaching Hospital Kano and willingness to participate in the study.

Exclusion Criteria

Children, patients on admission (In-patients), pregnant and lactating women were not part of the sample

Sample size and Sampling Technique

The respondents of the study consisted of the out-patients of Aminu Kano Teaching Hospital selected by simple random sampling technique.

The sample size for the study was calculated using the formula as follows;

$$n = \frac{(Z^2 \times P\ (1-P)}{d^2}$$

where; n= required sample size.
Z= value confidence level at 95% (standard value of 1.96).
P= estimated prevalence
d= precision of Margin of Error at 5% (standard value of 0.05).

Therefore, for this study, the sample size is calculated as

N = ?
Z= 1.96
P=9.5%. (18)
d= 0.05

$$n = \frac{1.96^2 \times 9.5\ (1-9.5)}{0.05^2}$$

$$n = 132.11$$

This sample size was increased to 140 to give room for non-responses and incomplete/lost questionnaires.

Hence, the respondents of study comprised of 140 out-patients of Aminu Kano Teaching Hospital, Kano State.

Ethical approval and consent

Ethical approval was obtained from the Research Ethics Committee of Aminu Kano Teaching Hospital, Kano State (NHREC/21/08/2008/AKTH/EC/2193). Informed verbal consent was obtained from all the patients of study after explanation of the details involved.

Research Instrument

The following instruments were used in data collection from the patients

1.Semi-structured questionnaire
2.Weight and height Stadiometer
3.Measuring tape
4.Omron M2 Digital Blood Pressure Monitor
5.ACCU Check Blood Glucose Monitor
6. Cardio-check blood testing device

Method of Data Collection

Questionnaire was interviewer administered to provide relevant information on socio-economic characteristics of the patients such as age, sex, marital status, level of education, occupation, income level etc.

Anthropometric measurements of weight, height, waist circumference and hip circumference were

taken using standard procedures. The weight and height were taken using a hospital weight and height meter scale (ZT-120 Stadiometer). These measurements were used to calculate the Body Mass Index (BMI) and the Waist to-Hip Ratio (WHR) and compared to standards - BMI based on WHO (17) classification and WHR based on WHO, 2008 classification).

The risk factors of MetS was assessed through measurement of blood glucose level either by fasting blood glucose or random blood glucose test using Battery powered ACCU Check glucometer adopting the American Diabetes Association classification (19).The fasting blood glucose was done after an overnight fast of 8-10hours.

Blood pressure measurement of the systolic and diastolic blood pressure was done using OMRON M2 Blood Pressure Monitoring Device. The reading was taken in duplicate, the mean recorded and compared with NCEP ATP III classification (20).

The HDL- cholesterol and triglyceride blood level was assessed through a Battery Powered Cardio-check Cholesterol and Triglyceride Analyzer in which 5ml of venous blood was drawn from each patient. The results were recorded in mg/dl and compared with NCEP ATP III (20).

However, according to NCEP-ATP III (2005), the criteria for metabolic syndrome (MetS) is defined by any 3 of the risk factors as shown in the Table 1. i.e. an individual having less than any 2 of the 5 of these risk factors (< 2/5) has no metabolic syndrome, the individual with any 2 of the 5 risk factors (2/5) is at risk while the individual having any 3 or more of the 5 risk factors (≥ 3/5) is presented with metabolic syndrome.

The nutrient intake of the patients was assessed using 24hour diet recall and food frequency questionnaire (FFQ) which provided information on the consumption pattern of the various food groups.

Data Analysis

Data obtained were analyzed with using SPSS version 20.0. Descriptive statistics such as frequencies, percentages, mean and standard deviations were determined. Food intake data collected was converted to nutrient intake with the aid of Nigerian Food Composition Table (21) and then compared with FDF (22). Recommended Daily Intake of the age and sex group.Inferential statistics - correlation was used to determine the relationship between the anthropometric characteristics, nutrient intake and the risk of metabolic syndrome among the patients.

Results

Socioeconomic characteristics of the patients

The socioeconomic characteristics of the patients are shown in Table 2. It indicated that more male

Table 1: ATP III Clinical identification of Metabolic Syndrome

Risk factors	Defining Level
Abdominal Obesity (waist circumference)	
Male	>102cm
Female	> 88cm
Triglyceride	≥150mg/dl
HDL Cholesterol	
Male	<40mg/dl
Female	<50mg/dl
Blood Pressure	≥135/≥ 85mm/Hg
Fasting Blood Sugar	≥ 100mg/dl

Source:(NCEP-ATP III, 2005)

(51.4%) patients participated in the study than female (48.6%) and were mostly within the age of 21-30years. More than half (53.6%) of the patients were married and are mostly (88.6%) muslims. Many of these patients earn less than ₦40,000, about 21% earn between ₦50,000 and ₦90,000 on monthly basis. The educational qualification of these patients revealed that about 29% had ND/NCE qualification, 21% had B.Sc., 17.9% had SSCE while 5.7% had no formal education and primary school certificate. Among the patients of study, 32.1%, 25% and 21.4% are civil servants, businessmen/traders and housewives/unemployed respectively while only 2.1% are farmers.

Table 2: Socioeconomic Characteristics of the patients

Variables	Frequency	Percentage (%)
Gender		
Male	72	51.4
Female	68	48.6
Age		
< 20	8	5.7
21 - 30	42	30.0
31 - 40	30	21.4
41 - 50	26	18.6
51 – 60	23	16.4
> 60	11	7.9
Marital Status		
Married	75	53.6
Single	45	32.1
Divorced/Separated	11	7.9
Widow	9	6.4
Religion		
Islam	124	88.6
Christianity	16	11.4
Monthly Income		
<₦40, 000	75	53.6
₦50, 000 - ₦90, 000	29	20.7
₦100, 000 - ₦200, 000	26	18.6
> ₦200, 000	10	7.1
Highest Level of Education		
No Formal Education	8	5.7
Primary School	8	5.7
Quranic Education	14	10.0
SSCE	25	17.9
ND/NCE	40	28.6
B.Sc.	30	21.4
M.Sc./Ph.D.	15	10.7
Occupation		
Civil Servant	45	32.1
Businessmen/traders	35	25.0
Farming	3	2.1
Students	27	19.3
Housewives/Unemployed	30	21.4
Total	**140**	**100.0**

Nutritional Status of patients by Body Mass Index (BMI)

The results of the nutritional status of the patients assessed through BMI are depicted in Tables 3. According to this Table, almost (54%) comprising of more male (61%) than female patients (45.6%) were of normal BMI, 22% are overweight (15.3% male; 29.4% female), 15% obese (11% male; 19% female) while less than 10% are underweight. This implies that more female than male were overweight and obese among the patients.

Distribution of risk factors of MetS among the patients

The distribution of risk factors of metabolic syndrome assessed is shown in Table 4. The risk factors assessed are; waist-hip ratio, fasting blood sugar level, random blood sugar level, high density lipoprotein cholesterol level (HDL-c), triglycerides level and the blood pressure. From this table, more females (22.1%) than males (8.6%) were at high risk of abdominal obesity whereas about 33% of the males were at low risk as against 15% females. The risk of having metabolic syndrome was higher among the females. However, generally 30.7% were at high risk, 21.4% at moderate risk while almost 48% were at low risk based on the waist-hip ratio (WHR). The results of the blood sugar test revealed more than half (53.6%) of the patients were at pre-diabetes stage based on fasting and random blood sugar testing, about 28% were normal while 18.6% were diabetic. The patients were at low risk based on the HDL-c and triglycerides testing and the blood pressure measurement also indicated almost 53% were normal and 20% hypertensive.

Prevalence of Metabolic Syndrome among the Patients

Table 5 shows the prevalence of MetS based on the subjects having three or more of the symptoms of high blood pressure (BP), high fasting blood sugar, low HDL-c, abdominal obesity and hypertriglyceridemia indicated a prevalence of 14.3% (≥3/5) while more than half (65.7%) had no metabolic syndrome (<2/5) and 20% were at risk (2/5).

Table 3: Nutritional Status of patients by Body Mass Index (BMI)

Variables				
BMI (kg/m ^{2})		Male (%)	Female (%)	Total (%)
		N = 72	N = 68	N = 140
Underweight	(< 18.5)	9 (12.5)	4 (5.9)	13 (9.3)
Normal Weight	(18.5 – 24.9)	44 (61.1)	31 (45.6)	75 (53.6)
Overweight	(25.0 – 29.9)	11 (15.3)	20 (29.4)	31 (22.1)
Obese	(> 30.0)	8 (11.1)	13 (19.1)	21 (15.0)

Table 4: Distribution of risk factors of MetS among the patients

Risk Factors		Frequency	Percentage (%)
Waist-Hip Ratio (Male)			
< 0.90	Low risk	46	32.9
0.9 - 1.01	Moderate risk	14	10.0
>1.02	High risk	12	8.6
Waist-Hip Ratio (Female)			
< 0.80	Low risk	21	15.0
0.81 - 0.88	Moderate risk	16	11.4
> 0.89	High risk	31	22.1
Total		**140**	**100.0**
Fasting Blood Sugar (mg/dl)			
< 100	Normal	20	14.3
100 - 126	Pre-diabetes	25	17.9
> 126	Diabetes	14	10.0
Random Blo od Sugar (mg/dl)			
79 - 140	Normal	19	13.6
141 - 199	Pre-diabetes	50	35.7
> 200	Diabetes	12	8.6
Total		**140**	**100.0**
HDL-cholesterol Level (Male) (mg/dl)			
< 40	High risk	10	7.1
> 40	Low risk	62	44.3
HDL-cholesterol Level (Female) (mg/ dl)			
< 50	High risk	18	12.9
> 50	Low risk	50	35.7
Total		**140**	**100.0**
Triglyceride Level (mg/dl)			
< 150	Low risk	112	80.0
> 150	High risk	28	20.0
Total		**140**	**100.0**
Blood Pressure (mmHg)			
Normal		74	52.9
Pre-hypertension		38	27.1
Hypertension		28	20.0
Total		**140**	**100.0**

Table 5: Prevalence of Metabolic Syndrome among the Patients.

Characteristics		Male (%) N = 72	Female (%) N = 68	Total (%) N = 140
No metabolic syndrome	(< 2/5)	54 (75.0)	38 (55.9)	92 (65.7)
At Risk	(2/5)	12 (16.7)	16 (23.5)	28 (20.0)
Metabolic Syndrome	(≥ 3/5)	6 (8.3)	14 (20.6)	20 (14.3)

Mean Energy and Nutrient Intake of the patients based on gender

The mean energy and nutrient intake of the patients of study based on gender compared with the daily recommended intakes (DRIs) showed that the mean intake of energy, carbohydrates, protein and fat for male as 2179.35kcal, 283.36g, 54.73g and 55.80g and for females as 2289.14kcal, 288.25g, 56.35g and 55.80g respectively for each of the nutrients. However, the intake of these nutrients was slightly below the DRIs among the males while it was slightly above the DRIs among the female except for fat intake that was slightly below the DRIs as indicated inTable 6. It further revealed the vitamins and minerals intake of the patients of study with respect to gender. Both sexes met the DRIs of the vitamins and minerals assessed as it

Table 6: Mean Energy and Nutrient Intake of the patients based on gender

Male					
	Energy (kcal)	**Carbohydrates (g)**	**Protein (g)**	**Fat (g)**	**Vitamin A (mcg)**
Mean intake	2179.35 ± 523.00	283.36 ± 28.87	54.73 ± 13.98	55.80 ± 23.24	3050 ± 312.5
DRI	2500	300	55	95	3000
% DRI	87.2	94.45	99.51	58.74	101.6
	Niacin (mg)	**Calcium (mg)**	**Iron (mg)**	**Iodine (mcg)**	**Zinc (mg)**
Mean intake	18.3 ± 2.69	1006.23 ± 277.9	11.2 ± 2.21	151.3 ± 37.1	12.4 ± 1.79
DRI	16	1000	8	150	11
% DRI	114.4	100.6	140	100.8	112.7
Female					
	Energy (kcal)	**Carbohydrates (g)**	**Protein (g)**	**Fat (g)**	**Vitamin A (mcg)**
Mean intake	2289.12 ± 526.20	288.25 ± 34.85	56.35 ± 12.86	57.05 ± 17.88	3866.2 ± 320.4
DRI	2000	230	45	70	2300
% DRI	114.46	125.33	142.75	81.5	168.1
	Niacin (mg)	**Calcium (mg)**	**Iron (mg)**	**Iodine (mcg)**	**Zinc (mg)**
Mean intake	22.8 ± 2.73	1246.13 ± 282.9	22.88 ± 2.31	157.12 ± 38.5	15.8 ± 1.99
DRI	14	1000	18	150	11
% DRI	162.7	124.6	127.1	104.7	143.6

was above the DRIs in both sexes.

Association between Anthropometric characteristics, risk factors and nutrient intakes of the patients

The results of the association between the anthropometric characteristics and nutrients intake of the patient is indicative that there was a significant association between BMI, WHR of both sexes and nutrient intakes of the patients at ($p < 0.05$) Table 7. Likewise, in Table 8, a significant association was observed between the risk factors of metabolic syndrome (MetS) assessed and nutrient intake at ($p<0.05$). However, fasting blood sugar had no significant association with protein ($p = 0.082 > 0.05$) but significantly associated with energy ($p = 0.000 < 0.05$), carbohydrate ($p = 0.013 < 0.05$) and fat intake ($p = 0.000 < 0.05$). The random blood had no significance association with protein ($p = 0.072 > 0.05$), fat ($p = 0.154 > 0.05$) and carbohydrate ($p = 0.050 > 0.05$) but had an association with the energy intake ($p = 0.024 < 0.05$). The triglyceride had significant association ($p < 0.05$) with all the nutrients assessed while blood pressure measurement had no significant association ($p > 0.05$) with all the nutrient intakes assessed in the study.

Table 7: Association between Anthropometric characteristics and nutrient intakes of the patients

Variables	Energy (p-value)	Carbohydrate (p-value)	Protein (p-value)	Fat (p-value)
BMI (kg/m^2)	0.000	0.000	0.000	0.000
WHR (Male)	0.000	0.001	0.013	0.000
WHR (Female)	0.003	0.004	0.006	0.041

Correlation is significant at $P<0.05$

P-value=Pearson correlation.

Table 8: Association between Risk Factors, Energy and Nutrient Intake of the patients

Variables	Energy (p-value)	Carbohydrate (p-value)	Protein (p-value)	Fat (p-value)
BMI (kg/m^2)	0.000	0.000	0.000	0.000
WHR (Male)	0.000	0.001	0.013	0.000
WHR (Female)	0.003	0.004	0.006	0.041
FBS (mg/dl)	0.000	0.013	0.082	0.000
RBS (mg/dl)	0.024	0.050	0.072	0.154
HDL-C (mg/dl) (Male)	0.017	0.107	0.661	0.026
HDL-C (mg/dl) (Female)	0.110	0.008	0.129	0.018
Triglycerides (mg/dl)	0.000	0.000	0.035	0.000
Blood Pressure (mmHg)	0.187	0.120	0.112	0.435

Correlation is significant at the 0.05 (2tailed)

P-value=Pearson correlation.

P-value >0.05 means there is no significant association

P-value<0.05 means there is significant association

DISCUSSION

The study assessed the nutritional status and the prevalence of metabolic syndrome among out-patients attending Aminu Kano Teaching Hospital, Kano State. The study comprised of more male patients than female patients. This is in contrast with the study on Metabolic Syndrome in Urban city of North-Western Nigeria (23) in which the number of female subjects was slightly higher than the male subjects. Most of the patients of study were in the age group of 21-30years and were married. This high proportion of married people among the respondents may have a significant impact on the occurrence of the risk of metabolic syndrome especially high blood pressure because marital issues like social, financial and nutritional obligations on the part of married couples had associated effect on blood pressure (24). The study also comprised of more Muslim respondents than Christians and could be attributed to the area of study known to be dominated by Muslims. This indicated that every individual of study belongs to certain religious group. Muslims and Christians have certain custom that has an association with some risk of metabolic syndrome. Typically prohibiting Muslims from eaten pork which is known to contribute significantly to build up of fat leading to hyper-triglyceride and hypertension is vital as it reduces the risk of developing the risk of metabolic syndrome.

A little more than half of the patients of study exhibited normal nutritional status as reflected by the Body Mass Index while overweight and obesity was more among the female similar to the study of Garrido (25) who reported a strong association between female gender and obesity. The same trend was observed among urban Fulani population of Northern Nigeria where females were more obese than the male respondents (26). This is suggested to be due to the fact that women engaged in less physical activities than men from the study area due to religious inclination that encourage women to stay at home in purdah to take care of the home front.

The prevalence of metabolic syndrome was based on the National Cholesterol Education Program-Adult Treatment Panel (NCEP ATP III) guidelines where metabolic syndrome was diagnosed when any three features of abdominal obesity, triglycerides, high density lipoprotein cholesterol level, high blood pressure and fasting blood glucose levels were present (23). In this study, the prevalence of metabolic syndrome was 14.3% which is similar to the study in Ilisan-Remo Ogun State (15). This could be because Hausa-Fulani usually have a lean physique that should prevent against metabolic syndrome (23). Also, it could be possibly due to lower prevalence of obesity seen in most of the patients of study as obesity has been suggested as the major underlying risk factor driving the presence of metabolic syndrome (12). However, with modernization some have become obese and adopted sedentary lifestyle that are risk factors for metabolic syndrome (26). This is contrary to previous reports of high prevalence of metabolic syndrome in Nigeria (27,28). This high prevalence was because the study was conducted in an urban area and urbanization is known to be associated with physical inactivity as well as nutritional transition to refined, low fibre and calorie dense meals (29). In addition, the result of the prevalence of MetS in this study is lower than that obtained in several studies in other parts of Nigeria; Oshogbo South Western Nigeria (34.3%) (12), in Sokoto North-Western Nigeria (20.5%) (30), in Enugu South Eastern Nigeria (15.9%) (31), and in Ghana (35.9%) (11)but closely comparable with the report from Abuja North Central Nigeria (14.9%) (32). The variation observed in prevalence from these studies may be due to the interplay of many factors such as the impact of genetics/race, lifestyle and prevalence of the constituent cardiovascular risk factors (33,34). The risk factors of MetS assessed showed more of the female patients with central obesity. Abdominal obesity was more prevalent among females than males and may be a result of low physical activity, diet high in calories and abdominal enlargement following pregnancy since most women find it difficult to return to their pre-pregnancy weight and abdominal status

(35). Christenson et al (36)in the study on women's perceived reasons for excessive postpartum weight retention associated eating more during pregnancy with belief that breastfeeding would lead to automatic weight loss but this never come true due to lower physical activity level of the postnatal period. This trend of central obesity in more female was observed in other studies. The International Diabetes Federation (37) further stated that it is excess body fat in the abdomen that is more indicative of metabolic syndrome profile than Body Mass Index. The blood glucose level (fasting blood glucose and random blood glucose) among the patients by NCEP-ATP III definition is (18.6%) which is favorable with the findings with the same percentage of prevalence in undiagnosed type 2 diabetes in South African colored population (38). The components of metabolic syndrome such as HDL-C, Triglyceride and blood pressure was low in the patients and this could be responsible for the low prevalence of metabolic syndrome observed in the patients. The low HDL-C levels in the study is in contrast with the study among apparently healthy Nigerians and adults in Ethiopia (39,40).Then, the consumption of vegetables may lead to high HDL since it contains niacin which has been reported to enhance HDL serum levels (41). However, rare consumption of vegetables was reported by the patients and could have possibly contributed to the low HDL-C observed. A little more than half of the patients had normal blood pressure which implies low tendency of hypertension.

The dietary intake of the patients of study indicated that the intake of nutrients among the male patients was slightly below their daily recommended intake while it was above the DRIs for the females. This could be responsible for the underweight status seen in some of the male patients and the overweight/obesity observed in the women coupled with low physical activities. The consumption of fruits and vegetable was poor among the patients while the main source of energy was basically from cereals, roots and tubers as well as fat which constitute part of the daily intake. However, high caloric intake and high fat intake increase the risk of metabolic syndrome by increasing oxidative stress (7) and it was recommended that saturated fat be replaced with monounsaturated or polyunsaturated fatty acids including reduction in the total amount of fat (42). The association between the anthropometric characteristics and nutrients intake of the patients showed a significant relationship between the parameters. The same trend was observed in the risk factors of metabolic syndrome and the nutrient intake except for the blood glucose level (fasting and random blood sugar), blood pressure and the female HDL-C which had no significant association with the intake.

Conclusion and Recommendation

Metabolic syndrome was observed among out-patients of Aminu Kano Teaching Hospital, Kano State. It was more in the female patients with abdominal obesity. Most of the patients exhibited normal nutritional status based on body mass index. The risk factors of metabolic syndrome had significant association with the nutrient intake. It is recommended that nutritional awareness program comprising of public health nutrition services and intervention be encouraged to highlight the dangers of the risk of metabolic syndrome to the public at clinical and community level especially among females.

Limitation

The study was limited to only the out-patients attending the Teaching hospital hence the results generated cannot be used to generalize other patients (in-patients). In addition, it did not put in mind the exact state of health in terms of the disease condition of the patients or the specific health complaints of each patient which might influence the outcome of the result positively or negatively. However, it has shown the existence of metabolic syndrome and its risk factors among the out-patients which might predispose them to cardiovascular related diseases.

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Conflicts of interest

The authors declare that they have no competing interest.

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