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PREVALENCE OF METABOLIC SYNDROME AMONG OBESE WOMEN ACCORDING TO THEIR TYPE OF FAT DISTRIBUTION YAOUNDE –CAMEROON

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ABSTRACT

Objective: Metabolic Syndrome is common among obese individuals. This study aimed to evaluate metabolic syndrome prevalence among obese women according to their upper (android) or lower (gynoid) type of fat deposition. **Methods:** The study was conducted on five hundred and twenty six women aged between18-60 years who were referred to the Andre Fouda Medical Fundation in Yaounde during multiple chronic diseases screening camps from march 2013 to march 2015. Fat distribution was done according to waist to hip ratio and Metabolic syndrome was diagnosed using Adult Treatment Panel-III (ATP-III) 2001 guidelines. **Results:** The result showed that mean of age, waist circumference, waist to hip ratio, systolic blood pressure and diastolic blood pressure were significantly higher in women with upper fat distribution while high density lipoprotein cholesterol and hip circumference was significantly lower comparatively to women ($P<0.05$) with lower fat distribution. The most frequent individual's components of metabolic syndrome were respectively high waist circumference, low high density lipoprotein-cholesterol levels and high blood pressure in the two group of women. Metabolic Syndrome was found in (50.19%) women with upper fat distribution and 29.36% in women with lower type of fat distribution. **Conclusion:** Women with android fat deposition were more prone to metabolic syndrome than women with gynoid fat deposition.

KEYWORDS: Metabolic Syndrome, Individual Components, Obesity, Upper fat distribution, Lower fat distribution, Women, Yaounde-Cameroon.

INTRODUCTION

The cluster of obesity, hypertension, dyslipideamia and hyperglyceamia refer to a medical term called Metabolic Syndrome.[1,2] it is a useful indicator of type 2 diabetes, cardiovascular diseases and many other unhealthy conditions.[3,4] Metabolic Syndrome prevalence varies in people according to their gender, age, social groups, ethnicity, nutritional status, etc.[5,6,7] Belonging to obese nutritional status is widely regarded as a major risk factor for cardiovascular disease, and premature death. 2 Studies show that health risks varies according to fat deposition on the body, upper and lower types of fat distribution should be associated with different degrees of the risk of cardiovascular and metabolic disorders.[8,9,10] Obesity is a serious health problem amongst Cameroonian women.[11] and no previous.[12,13,14,15,16,17,18] Cameroonian metabolic syndrome study study has evaluated Metabolic Syndrome in Cameroon obese women according to their fat deposition. This study planned to estimate Metabolic Syndrome prevalence between Cameroonian obese women with upper fat distribution and Cameroonian obese women with lower fat distribution.

MATERIALS AND METHODS

Ethics Statement

Study design

This cross sectional study was conducted from March 2013 to April 2015 to Andre Marie Fouda Medical Fundation and comprised women recruited through various special cardiovascular diseases free screening camps. Women were invited through media, announcement after mass, in many cultural groups. All the volunteer women were referred to the Medical fundation. The exclusion criteria were diabetes mellitus 1 and 2 types, acute heart and pulmonary diseases, malignancy, acute infections and inflammatory diseases, pregnancy, lactating, underweight, normal weight overweight, morbid and neuroendocrine obesity, and age less than 18 years.

Ethics

The study was approved by the Education Planning Commission of Medical Center Fundation. Every woman gave her verbal Informed Consent and the study protocol was executed according to Helsinki Declaration.

Data Collection

The study team worked in all week days except sundays. The data collection comprised healthcare questionnaire, anthropometric measurement of weight, Height, waist circumference and hip circumference, health examination and laboratory test in fasting state for lipids and glucose.

Height, weight, waist and hip circumference were all measured using standardized techniques and calibrated equipment. BMI was calculated by dividing weight by height squared (kg/m^2) classified according to WHO rules≥30.[19]

A well trained nurse drew 12 hours fasting morning blood samples from the examinee's arm, the blood samples were centrifuged for 10 minutes at 3000 rpm and the serum was separated. The plasma concentration of triglycerides, total cholesterol and HDL-cholesterol was determined by a biochemical kit and using spectrophotometer techniques in the Medical foundation laboratory. Standardized techniques were used to obtain the blood pressure measurements after at least 10 min of rest.

Waist circumference (cm) and hip circumference (cm) were determined using measuring tape to the nearest 5 mm as described in the WHO recommendations.[20] The height was measured in standing position using tape meter while the shoulder was in a normal position to the nearest millimetre (Siber Hegner, Zurich, Switzerland). Body weight and body fat were determined in 12-h fasted participants (with very light clothing on and without shoes) using a Tanita™ scale. Total cholesterol and triglycerides in plasma were measured using previously described standard methods.[21,22] High Density Lipoprotein cholesterol was determined using a heparin manganese precipitation of Apo B-containing lipoproteins.[23] Fasting capillary blood glucose was determined using glucose test strips (Gluco Plus TM).

Definition of upper or lower types of body fat distribution

Waist-to-hip ratio was calculated by dividing waist circumference by hip circumference. When this value was less than 0.85 for women, these women were said to present lower (gynoid) type of fat distribution, and when this value was equal or higher to 0.85, they were classified under the group with upper (android) type of fat distribution.[24]

Definition of Metabolic Syndrome

Women were considered to have Metabolic Syndrome if they had three or more of the following criteria, according to the ATPIII criteria.[25]

1. Abdominal obesity, defined as a waist circumference in women ≥ 88 cm (35 inch).
2. Hypertriglycerideamia≥150mg/dL (1.7mmol/L) or drug treatment for elevated triglycerides
3. Low High Density Lipoprotein-C < 50 mg/dl for women, or drug treatment for low HDL-C.
4. Hypertension: known hypertensive or Systolic Blood Pressure >130mm Hg, and or Diastolic Blood Pressure >85 mm Hg or drug treatment for elevated blood pressure.
5. Dysglycemia: known diabetes mellitus or fasting plasma glucose >110 mg/dl or drug treatment for elevated blood glucose.

Statistical analysis

All data were analyzed by STATA® 8.2. Continuous variables are reported as means ± standard deviations (SD) and categorical variables are presented as percentages. A *p* value less than 0.05 was considered statistically significant. Quantitative and qualitative variables were tested using Student's t-test and the chi-square test respectively. P value <0.05 was considered statistically significant.

RESULTS

Characteristics of the study population

Demographic and clinical characteristics of the studied population are shown in Table 1. There were 526 volunteers obese enrolled to participate in the study. 51.14% women with lower fat distribution or gynoid obese women and 48.85% women with upper fat distribution or android obese women. The mean BMI of all studied women was 35.19 ± 5.98 kg/m^2. Android obese women exhibit significant higher mean of age, waist circumference, waist to hip ratio, systolic blood pressure and diastolic blood pressure but significant lower high density lipoprotein cholesterol and hip circumference comparatively to gynoid obese women. The prevalence of metabolic syndrome and its components are reported in table 2. The frequency of metabolic syndrome was significant high (50.19%) among women with upper fat distribution comparatively to women with lower fat distribution (29.36%). The most frequent individuals components of metabolic syndrome were respectively were abdominal obesity, low HDL cholesterol, high blood pressure, high fasting glucose and increased triglycerides in the two group of studied women. It appears that among the five individual

metabolic syndrome components only two (high waist circumference and low high density lipoprotein-cholesterol levels) were significantly high in obese android women comparatively to obese gynoid women. Table 3 shows the presence of zero and one or more components of the metabolic syndrome. All women with upper fat distribution presented at least one metabolic abnormality while no women with lower fat distribution had fith metabolic abnormalities. A high proportion of women had premetabolic syndrome with two metabolic abnormalities in android obese Women (50.19%) and (47.94%) of gynoid obese women. Table 4 reports metabolic syndrome presence or not according to fat distribution. More than half of women with upper fat distribution has metabolic syndrome while less than one third of women with lower fat distribution has metabolic syndrome.

Table 1: Demographic and clinical characteristics of Total, android and gynoid Women.

Parameters	Total	Android Women	Gynoid Women	P value
All women, No. (%)	526(100%)	257(48.85%)	269(51.14%)	-
Age (years)	35.86 ±9.40	38.48 ± 9.88	33.34 ± 8.96	0.000*
BMI, kg/m²	35.19 ± 5.98	35.21 ± 4.99	35.17 ± 6.39	0.932
WC, cm	100.95 ± 12.21	107.34 ± 11.42	95.35 ± 12.21	0.004*
HC, cm	115.68± 10.68	106.57± 13.10	117.27±9.42	0.000*
WHR	0.87±1.14	1.00± 0.87	0.81±1.29	0.000*
SBP, mmHg	127.15 ± 23.78	129.66 ± 20.53	125.68 ± 26.81	0.025*
DBP, mmHg	86.21 ± 14.50	88.47 ± 14.72	85.00 ± 14.35	0.048*
FBS, mg/dl	92.45 ± 19.22	91.46 ± 11.17	93.40 ± 8.02	0.655
TG, mg/dl	96.74 ± 23.16	95.80 ± 25.17	97.68 ± 29.91	0.226
T-Chol, mg/dl	146.84 ± 53.64	151.77 ± 56.63	142.18 ± 50.73	0.353
HDL-Chol, mg/dl	46.75 ± 40.73	40.94 ± 42.33	55.26 ± 39.49	0.000*

BMI: Body mass index, WC: waist circumference, HC: Hip circumference, WHR: waist to hip ratio, SBP: systolic blood pressure, DBP: diastolic blood pressure, FBS: fasting blood glucose, TG: triglyceride, T-CHOL: total cholesterol and HDL-CHOL: HDL-cholesterol *P value less than 0.05 was considered significant.

Table 2. Metabolic Syndrome and its components frequency in obese women with upper or lower types of body fat distribution.

Individual components	Android Women 257	Gynoid Women 269	χ^2	P-Value
Hyperglyceamia	59(22.95%)	60(22.30%)	0.03	0.085
Low HDL	151(58.75%)	111(41.26%)	19.38	0.000*
High Triglycerides	36(14.00%)	33(12.26%)	0.04	0.841
Abdominal Obesity	229(89.10%)	207(76.95%)	42.97	0.000*
Hypertension	82(31.90%)	65(24.16%)	1.25	0.263
Metabolic Syndrome	129(50.19%)	79(29.36%)	23.84	0.000*

$\chi 2$ = Criterion size, * $P<0.05$ considered significant.

Table 3. Metabolic Syndrome Items in obese women with upper or lower types of body fat distribution.

Parameters	Total	Android Women	Gynoid Women	P-Value
0 criteria n (%)	7(0.38%)	0 (0.00%)	7(2.60%)	0.009*
1 criteria n (%)	86(16.34%)	31 (12.06%)	55(20.44%)	0.009*
2 criteria n (%)	225(42.77%)	97 (50.19%)	128(47.94%)	0.023*
3 criteria n (%)	161(30.60%)	96(37.35%)	65(24.16%)	0.001*
4 criteria n (%)	44(8.36%)	30(11.67%)	14(5.20%)	0.007*
5 criteria n (%)	3(0.57%)	3(1.16%)	0 (0.00%)	0.076

Table 4: Distribution of obese women with upper or lower types of body fat distribution With and without Metabolic Syndrome.

Obesity	MetS positive	MetS negative	Total
Android Women	129 (50.19%)	128 (49.80%)	257
Gynoid Women	79 (29.36%)	190 (70.63%)	269
Total	202 (38.40%)	318 (61.60%)	526

MetS: Metabolic Syndrome.

DISCUSSION

Africa is facing at the same time the double burden of infectious and chronic diseases. Chronic diseases are now identified as the most serious health problem in both developed and developing countries. Obesity is the frequent form of malnutrition and is associated to a high number of diseases. The prevalence of abdominal obesity is increasing in western populations, possibly due to a combination of low physical activity and high-calorie diets, and also in developing countries, where it is associated with the urbanization of populations.[26] Many studies have suggested that obesity play a critical role in the pathophysiology of metabolic syndrome aetiology. Only few studies have focus on metabolic syndrome prevalence among women and their type of fat distribution. Among the 526 women selected for the study, 257 exhibit upper fat distribution while 269 had lower fat distribution. An overall prevalence of metabolic syndrome of 38.40% was reported in the study. This prevalence was distributed as 50.19% among women with upper fat distribution and 29.36% among women with lower fat distribution. Metabolic Syndrome is 1.70 nearly common in women with upper fat distribution than women with lower fat distribution. This study showed that women with upper fat distribution were more likely to have metabolic syndrome compared to those with lower fat distribution. A previous Russian adult study has found an estimate of Metabolic Syndrome prevalence of 60.4% among women with upper fat distribution and 32.1% to those with lower fat distribution.[27] This estimate is higher than the

one reported in our study and could be attributed to their lower population size. Metabolic Syndrome is diagnosed if at least three of the five proposed criteria are present; in this study 42.77% women already had two criteria. This finding underscores the importance of education among women in their different communities and control of risk factors.

In the whole sample, the most commonly found abnormalities were abdominal obesity and low HDL, the intermediary individual frequent ones components were high blood pressure and high fasting glucose, increased triglycerides was the less frequent component. A significant increased prevalence of all individual components was found among women with upper than women with lower type of obesity. This current study confirms that upper fat is the depot that conveys the biggest health risk than the lower body fat that protects concerning Metabolic Syndrome.[28,29]

The accumulation of fat in abdominal region is connected with increase in size of intra-abdominal visceral adipose tissue rather than subcutaneous fat and lead to lipotoxicity throught different mecanisim. The release by visceral fat cells of their metabolic products (excess of triglycerides and fatty acids) in the portal circulation, where the blood leads straight to the liver for accumulation. Consequently free fatty acids are the first substrate for energy production, and favour insulin resistance, impaired glucose metabolism, lipid disorders and hypertension.[30] It is also known thathe upper type of fat distribution, Visceral adipose tissue has been recognized as an highly active endocrine organ because of their production of adipocytokines, which induce insulin resistance and play a major role in the pathogenesis of endothelial dysfunction and subsequently atherosclerosis.[31,32] On the other hand Hypoadiponectinemia is noticed in individuals with upper fat distribution, which protects against the development of diabetes mellitus, hypertension, inflammation and atherosclerotic vascular diseases, decreased in individuals with visceral fat accumulation.[33] In contrast, the lower type of fat distribution, the first substrate of energy metabolism is glucose, and lipids are less used for energy metabolism and accumulated in subcutaneous fat. Therefore, visceral fat accumulation is a major correlate of a cluster of diabetogenic, atherogenic, prothrombotic and proinflammatory metabolic abnormalities referred to as the metabolic syndrome.[34] The main limitation of this study was it cross-sectional design and its realization in urban areas who is not representative of the population of Cameroon.

CONCLUSION

This study provides evidence that Metabolic Syndrome is distributed among obese women of both type of fat distribution; however the risk is higher in women with upper fat distribution.

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Declaration of Conflicting Interest

The authors declare that there are no conflicts of interest.

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