Original Article

Prevalence of Overweight and Obesity in Maiduguri, North-Eastern Nigeria

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ABSTRACT

BACKGROUND: The prevalence of obesity is on the increase worldwide including in many developing countries. There is no report on the magnitude of obesity among adults in Maiduguri, a major city in northeastern Nigeria.

MATERIALS and METHODS: We selected a sample of 1650 men and women aged 15 years and above resident in Gwange ward in Maiduguri metropolitan council using a multistage sampling technique. Height, weight, waist (WC) and hip circumferences were measured. Body mass index (BMI) and waist-to-hip ratio (WHR) were calculated. Data were analyzed using SPSS version13. The ethics committee of the University of Maiduguri Teaching Hospital approved the study and consent was sought individually from the participants before being enlisted.

RESULTS: The mean (SD) age of the respondents was 36.2 (14.4) years, with a range of 15 to 70 years. The mean (SD) ages of the males and females were 34.9 (14.3) and 38.9 (14.0) years, respectively, ($p<0.001$). The overall crude prevalence rates of overweight and obesity were 27.1% and 17.1%, respectively. In men, 40.6% were either overweight or obese, while in women 51.9% were either overweight or obese. We observed the highest prevalence rates of overweight and obesity in the middle age group. There were more obese females than males (14.05 vs. 4.3%) among both young and elderly (12.1% vs. 10.5%) subjects.

CONCLUSION: The prevalence of overweight and obesity is high in Maiduguri metropolis particularly among women. Concerted efforts should be made to curb the menace of increasing rate of obesity in the metropolis through public enlightenment on the risks associated with obesity and the benefits of adopting a healthy lifestyle.

KEY WORDS: Overweight, Obesity, Prevalence, Maiduguri.

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INTRODUCTION

In 2005, the World Health Organization (WHO) reported that approximately 1.6 billion adults (aged 15 years and above) were overweight, and at least 400 million were obese.[1] These figures are projected to rise to 2.3 billion and 700 million, respectively by 2015.[1] The prevalence of overweight and obesity in Nigeria as reported by WHO in 2008 was 26.8% and 6.5% respectively.[2] Obesity has been associated with several non-communicable diseases such as hypertension, diabetes and lipid disorders as well as with increased morbidity and mortality among adults.[3] Globally, there is a disturbing trend towards increasing adiposity.[4] The WHO has since emphasized that obesity is becoming a major health problem in many developing countries, particularly among adult women.[3] This has been attributed to the nutritional transition being experienced in most of these countries.[3] The present study to the best of our knowledge is the first large scale study on the prevalence of overweight and obesity, using the WHO STEPS[5] methodology to be conducted in northeastern Nigeria. Findings from this study will provide baseline data on which similar studies in the future can build upon.

MATERIALS AND METHODS

The study was conducted in Maiduguri, the capital of Borno State, northeastern Nigeria. We used a multistage sampling technique to select participants for the study. In stage one, Maiduguri Metropolitan Council (MMC) was picked (by lot casting) from the two existing local governments in Maiduguri. Stage two, entailed the selection of Gwange 1 ward by simple random sampling from the 22 wards in MMC. The selection was done using simple balloting. In stage three, we carried out a household enumeration to identify eligible residents. In all, 1700 subjects from 340 households selected systematically (every second household based on calculated sampling fraction) were identified and were invited to participate in the study. We excluded pregnant women, subjects that cannot stand or are wheelchair bound and ill subjects from the study. Permission and cooperation for the study was obtained from the ward head of Gwange ward and consent sought individually from the participants before being enlisted. The ethics committee of the University of Maiduguri Teaching Hospital approved the study.

Study procedure

The survey was conducted twice weekly (Saturdays and Sundays) between July 2008 and January 2009.Subjects presented at the survey site between 0800 and 1200 hours. After registration, trained assistants under the

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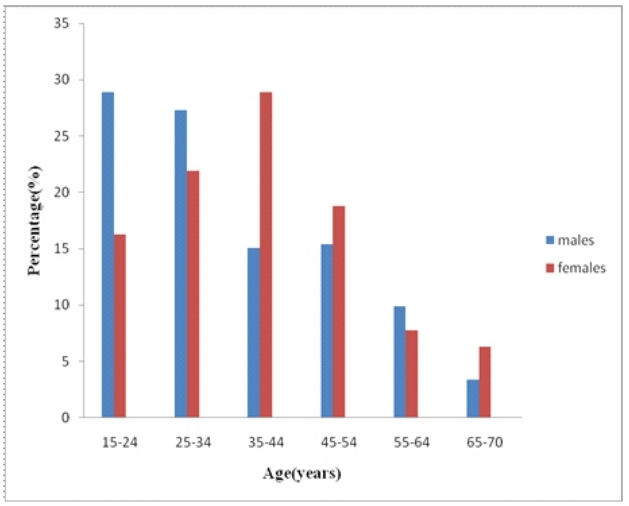
supervision of the authors carried out data collection from eligible subjects. To enhance response, the assistants were gender matched with the study subjects. A pre-tested questionnaire adapted from the WHO STEPS instrument was used.[5] Subjects were measured for height (in metres) to the nearest 0.1cm using portable locally manufactured stadiometers. Subjects stood erect, without shoes and headgears, on a flat surface with the heels and occiput in contact with the stadiometer. Weights were recorded in kilograms (to the nearest 0.5kg) using a calibrated bathroom scale (Soehnle-Waagen GmbH & Co. KG, Wilhelm-Soehnle-Straße 2, D-71540 Murrhardt/Germany) positioned on a firm horizontal surface, with the subject clad in minimum clothing and without shoes. The zero mark was checked each week and calibration was done by reference to an object of known weight. Body mass index (BMI) was calculated by dividing the weight (kg) by the square of the height in metres (m^2).Waist circumference was measured to the nearest 0.1cm (with a non-stretchable dressmaker's tape) at a point mid-way between the margin of the lowest rib and the iliac crest. Hip circumference was measured at the horizontal level of maximum circumference around the buttocks (posteriorly) and the pubic symphysis (anteriorly) to the nearest 0.1cm.Waist-to-hip ratio (WHR) was calculated by dividing the waist circumference (cm) by the hip circumference (cm).

The following age categorization was used in this study: young (15-34 years), middle age (35-64years) and elderly (65-70 years). Four categories of BMI (<18.5, 18.5 -24.9, 25 -29.9, and >30 kg/m2) were identified. The categories were selected according to WHO recommendations to define individuals with a healthy weight (BMI 18.5-24.9 kg/m2), overweight (BMI 25-29.9 kg/m2) and obese (BMI>30 kg/m2).6 Subjects with a BMI<18.5 kg/m2 were classified as underweight. Data were analyzed using SPSS version 13 (SPSS, Chicago, Illinois, USA) statistical package, and were performed separately for men and women. Age-adjusted partial correlation coefficients were calculated to determine the relationship between the anthropometric indices. P values 0.05 or less were considered statistically significant.

RESULTS

Of the 1700 subjects recruited for the study, 1650 responded giving a response rate of 94.3%. The age and sex distribution of the study subjects is shown in Figure 1. The study population comprised 1124 (68.2%) males and 526 (31.8%) females. The mean (SD) age of the respondents was 36.2 (14.4) years, with a range of 15 to 70 years. The mean (SD) ages of the males and females were 34.9 (14.3) and 38.9 (14.0) years, respectively, ($p<0.001$).

Figure 1: Distribution of the study subjects by age and sex



Legend: The majority of the subjects are in their second and third decades

Anthropometric measurements

Table 1 shows the means of anthropometric variables by sex and age groups of the study subjects. The mean levels of BMI and WC, but not WHR, were higher among women than among men across the age groups. All the anthropometric indices peaked in the middle age group, and then declined thereafter.

Table 1: Distribution of anthropometric indices by age group and sex among the study subjects.

	N	BMI	WC	WHR
Males				
15 24	**325**	**21.7(3.8)**	**74.7(10.8)**	**0.88(0.11)**
25 34	**307**	**24.8(4.7)**	**82.7(12.1)**	**0.90(0.09)**
35 44	**170**	**25.4(4.9)**	**85.5(11.8)**	**0.91(0.08)**
45 54	**173**	**25.7(4.9)**	**89.8(12.9)**	**0.92(0.09)**
55 64	**111**	**25.8(4.4)**	**90.0(12.2)**	**0.96(0.07)**
65 70	**38**	**24.1(3.8)**	**88.2(10.3)**	**0.96(0.06)**
Total	**1124**	**24.3(4.8)**	**82.9(13.2)**	**0.91(0.10)**
Females				
15 24	**86**	**22.1(5.7)**	**74.7(12.7)**	**0.85(0.07)**
25 34	**115**	**24.3(5.4)**	**86.5(13.8)**	**0.88(0.08)**
35 44	**152**	**26.6(6.5)**	**84.7(13.2)**	**0.87(0.06)**
45 54	**99**	**27.9(6.4)**	**92.6(13.7)**	**0.91(0.09)**
55 64	**41**	**25.9(5.1)**	**90.3(10.9)**	**0.90(0.06)**
65 70	**33**	**23.9(4.8)**	**82.6(19.7)**	**0.86(0.14)**
Total	**526**	**25.6(6.2)**	**85.5(14.8)**	**0.88(0.09)**

Data are mean (SD). WC-(Waist circumference in cm), BMI (Body mass index in kg/m^2),

WHR(Waist Hip Ratio).

Prevalence of overweight and obesity

The distribution of the prevalence rates of overweight and obesity based on BMI is shown in Table 2. The prevalence of overweight was 26.2% in males and 29.1% in females, while obesity was found in 14.4% of males and 22.8% of females, respectively. More than half of the females were either overweight or obese. The difference in the prevalence of obesity between males and females was particularly large in the younger age group (15- 24 years), where the ratio of the prevalence of obese females to obese males was over three (14.0% versus 4.3%). The highest prevalence rates of both overweight and obesity were however, observed in the middle age group.

Table 2: Prevalence of overweight and obesity based on WHO criteria[15] according to age categories by sex of the study subjects.

Age group(years)	Males			Females		
	No of subjects	Overweight n (%)	and Obese n(%)	No of Subjects	Overweight n(%)	and Obese n(%)
15-24	325	43(13.2)	14(4.3)	86	14(16.3)	12(14.0)
25-34	307	84(27.4)	52(16.9)	115	44(38.3)	15(13.0)
35-44	170	58(34.1)	36(21.2)	152	42(27.6)	45(29.6)
45-54	173	58(33.5)	36(20.8)	99	33(33.3)	34(34.3)
55-64	111	38(34.2)	20(18.0)	41	14(34.1)	10(24.4)
65-70	38	13(34.2)	4(10.5)	33	6(18.2)	4(12.1)
Total	1124	294(26.2)	162(14.4)	526	153(29.1)	120(22.8)

Interrelationship between the anthropometric indices

Table 3 shows the relationship between the anthropometric indices. The WC correlated positively and significantly with both BMI and WHR. The correlation between BMI and WHR was however, weak (r=0.17) though statistically significant.

Table 3: Relationship between the anthropometric indices.

Variable	BMI (kg/m^2)	WC (cm)	WHR	Weight (kg)
BMI	1	0.59*	0.17*	0.89*
WC	0.59*	1	0.48*	0.59*
WHR	0.17*	0.48*	1	0.20*
Weight	0.89*	.59*	0.20	1

*** = statistically significant (p<0.05). Values are correlation coefficient r (rho).**

DISCUSSION

Excess body fat is well documented as being a risk factor for numerous chronic conditions such as diabetes, hypertension, hyperlipidaemia and cardiovascular diseases.[8] Studies of anthropometric measures among adult populations of sub-Saharan African countries are limited. Weight and BMI are the most common indicators used to assess the prevalence of overweight and obesity in population based studies.

The prevalence rate of both overweight and obesity in this study [44.2% (males 40.6% and females 51.9%)] is higher than the rates previously reported from other population surveys in Nigeria.[2,7] Puepet *et al* [9] in a study of 825 Nigerian adults in Jos metropolis (2002), reported rates of 19.4% and 23.5% in males and females, respectively. Maiduguri is experiencing rapidly changing social and economic characteristics. Thus, people have migrated from the traditional low fat fiber rich diets, to consumption of calorie-dense western style diet.[10] This nutritional transition may portend future increase in the burden of non-communicable diseases such as diabetes and hypertension in the studied population.

Given that the demographic characteristics of most cities in this part of the country are similar; this nutritional transition coupled with sedentary lifestyle over time, may explain the higher rates of overweight and obesity in this study. The prevalence of both overweight and obesity in this study is however, lower than the 83% reported by Fadupin *et al*[11] among a population of type 2 diabetics in Ibadan. An earlier Nigerian study by Johnson[12] in metropolitan Lagos, found 4.3% of 440 males and 26.5% of 476 females to be overweight, while 3.1% and 14.9% of males and females, respectively were obese. The higher proportion of overweight and obese females than males observed in the Lagos study is similar to the findings in this study. Several studies in both diabetic and non-diabetic populations have shown that obesity tends to occur more commonly among females than males. [9, 13] Apart from genetic and hormonal differences, this observation has been linked to lower level of physical activity among females.[14]

The highest prevalence of overweight and obesity in this study was recorded in the middle age group. This concurs with the findings of Johnson[12] and Puepet[9] who reported a higher prevalence in a similar age group among their subjects. Of note is the higher proportion of obese females compared to males (14.0% vs 4.3%) in the15-24 year age category. This finding may suggest that obesity among our female subjects starts at a young age, as was reported in a South African study.[15] The implication of this observation is that, primary prevention of obesity in our environment should probably start at a younger age, particularly for girls. .

In this study, overweight and obesity were determined by referring to WHO standards (BMI or quetelet index).[16] The major limitation of BMI is that it does not differentiate between weight that is due to fat mass and that due to muscle mass. Furthermore, BMI does not provide information about fat distribution and therefore does not identify abdominal obesity. In this regard, indices of visceral fat distribution such as WC and WHR have been reported to be superior.[17] However, BMI in our study correlated positively and significantly with WC although, less so with WHR. Females had higher mean values of WC and BMI than males in this study, while the males had higher mean value of WHR. Similar

observations in gender patterns of anthropometric indices were made in the South African study.[15] Since WHR is derived from two body circumferences (WC and HC), the presence of larger mean hip circumference in females than males in this study, may partly be responsible for the higher WHR in the males. In general, the mean WC and BMI in both sexes increased with age until 64 years, when it starts to decline. Puoane *et al* [15] in a study of obesity in 13,089 South African men and women also reported similar findings. The mean WHR also increased with age especially among males in this study.

CONCLUSION

The high prevalence of overweight and obesity in Maiduguri metropolis as demonstrated in this study is indeed worrisome. Considering the association between obesity and chronic non-communicable diseases such as diabetes mellitus, hypertension and ischaemic heart disease, the high prevalence of obesity observed in this population may portend a surge in the incidence of these disorders. There is therefore, an urgent need for concerted effort to control the rising trend in obesity among the population in Maiduguri metropolis. This can be achieved through public enlightenment about the risks associated with obesity and the benefits of adopting a healthy lifestyle.

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