

PREVALENCE OF OVERWEIGHT AND OBESITY AMONG URBAN NIGERIA ADULTS IN JOS

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ABSTRACT

Background and objective:

Overweight and obesity have been shown to be associated with non-communicable diseases (NCDS) like type 2 Diabetes, Hypertension and Ischaemic Heart disease (IHD) both in longitudinal and cross sectional studies. Few studies have determined the prevalence of overweight and obesity in Nigerian population. In the absence of any standard weight for height tables for the adult population in Nigeria, earlier studies referred the weights of subjects to widely used standards given for adult American subjects. In this study, overweight and obesity were determined using the Body-mass index (BMI, kg/m²)(Quetelet index). The study defines the prevalence of overweight and obesity among a sample of adult Nigerians living in Jos, Nigeria.

Study design and methods:

With a two-stage random cluster-sampling scheme based on existing administrative divisions, 902 subjects, > 15 years of age residing in central Jos were enlisted. Of the 902 subjects, 825 (403) males and 422 females were examined. Pregnant and ill subjects were excluded. Body-mass index (BMI) was defined as weight (kg) divided by the square of the height in meters (m²). Subjects with BMI > 25kg/m² were regarded as being overweight obese, and those with BMI > 30kg/m² as being definitely obese.

Results:

The prevalence of overweight and obesity was 21.4% (19.4% in males and 23.5% in females (M:F = 1.3, p < 0.05). Of the 21.4% overweight and obese subjects, 17.2% were overweight, while 4.2% were obese. Prevalence of overweight was 15.4% of males and 4.5% of females were definitely obese. The highest incidence of overweight and obesity were found in the 35-44 years age group. All overweight and obese subjects had abnormal waist-to-hip ration (WHR), a parameter for abdominal fat deposition. BMI correlated positively and significantly with WHR (r = 0.64 P < 0.001).

Conclusion:

The prevalence rates of overweight and obesity in urban adults in Jos appear moderately high. The results from this study indicate that overweight and obesity which were previously thought to be infrequent in the Africans, are rising in frequency which may explain the rising trend of NCDS in urban African adults.

Key words: Overweight, Obesity, Body-mass index (BMI), Waist-to-hip ration (WHR).

INTRODUCTION

In a strict sense obesity can be defined as an excess of body fat relative to the amount of non-adipose tissue in the individual. In clinical practice it is not infrequently equated with overweight. Moderate deposition of fat can occur in the individual who is not overweight and muscular hypertrophy may cause an appreciable increase in weight with only a minimum accumulation of adipose tissue in the body⁽¹⁾.

When fat collections are gross, reliance can be placed on a diagnosis derived from a direct clinical appraisal of the subject. The distinction between overweight and obesity is not often easy, and different criteria have been used by many authors in obtaining cut-off points on weights and weight-for-height charts at which overweight in the individual subject becomes obesity^(2,3,4).

Excess body fat is associated with cardiovascular diseases, type 2 diabetes mellitus, several important cancers, and numerous other medical conditions⁽⁵⁾ and is a growing problem in many countries. In the United States, for example, the age-adjusted prevalence of obesity increased by approximately 30% from 1980 to 1994⁽⁶⁾.

Although various research techniques have been described for the measurement of the amount of adipose tissue in the body⁽⁷⁾, most of these are unsuitable for epidemiological studies or even for the routine clinical assessment of the individual subject.

In clinical practice and in large epidemiological studies, body fat is most commonly estimated by using a formula that combines weight and height. The underlying assumption is that most of the variation in weight for persons of the same height is due to fat mass. The formula used most frequently in epidemiological studies is the body-mass index (BMI), also called the Quetelet index, which is the weight in kilograms divided by the square of the height in meters. Quetelet observed empirically that in adults this index is minimally correlated with fat mass measured densitometrically and adjusted for height (r is approximately 0.9 for both men and women), other indices based on weight and height do not appear superior^(9,10). Measurements of weight and height, even those reported by subjects themselves are highly accurate and do not contribute importantly to errors in assessing body-mass index⁽¹⁰⁾. The principal limitation of BMI as a measure of body fat is that it does not distinguish fat mass from lean mass.

Other methods used in assessing fatness are body circumferences (most commonly waist and hip), skin-fold thickness and bioimpedence. The measurement of body circumference has received attention because of the interest in excess visceral (intra-abdominal) fat-

independent of total adiposity as a potential risk factor in chronic illness. Waist circumference and the ratio of waist circumference to hip circumference (waist-to-hip ratio) have both been used for this purpose, but neither provided a precise estimate of visceral fat^(11,12). Measurements of skin-fold thickness can provide a reasonable assessment of body fat, especially if taken at multiple sites, and provide additional information on the location of fat. However these measurements are subject to considerable variation between observers, do not provide information on abdominal and intramuscular fat, and in general are not superior to simple measurements of weight and height^(9,10). Thus, measurements of skin-fold thickness are most useful to specialists in body composition and for research.

In the socially and economically developed communities of Europe and America, the basic data on weights and heights for normal population or sections of it have been described for many among whom is the African population. Few population studies have determined the prevalence of overweight and obesity in Nigerian populations. In the absence of any standard weight for height tables for the adult population in Nigeria, early studies referred the weights of subjects studied to widely used standards given for adult American subjects⁽⁴⁾. In this study overweight and obesity were determined by referring to WHO standards (BMI or quetelet index)^(13,14).

OBJECTIVE

To determine the prevalence of overweight and obesity among adults of an urban Nigerian population sample using widely accepted anthropometric indices.

Study Design and Methods

Study population: The study population was obtained from Dagip ward (Abattoir area) in Giring district situated in Central Jos, the capital city of Plateau State in North Central Nigeria. A two-stage random cluster-sampling scheme based on existing administrative divisions was used to select Digip ward. Giring was randomly picked out of 6 districts in Jos, and Dagip was again randomly picked out of 12 wards in Giring district. This area gave a sample which was very closely representative of the entire population of the metropolitan area, and included respondents from the main ethnic groups in the State and Northern Nigeria, with a substantial proportion of the major ethnic groups of the Federation.

Subjects: Nine hundred and two subjects ≥ 15 years of age living in the survey area were sampled. Of the 902 subjects, 825 (403 males and 432 females) respondents were examined. Pregnant females and ill subjects were excluded.

Permission and cooperation for the study was obtained from the ward head and consent was sought individually from the participants before being enlisted. The study was approved by the Ethics Committee of Jos University Teaching Hospital prior to commencement.

Survey procedure: The survey took 10 weeks from November 1994 to January 1995. Survey was conducted weekly (Saturdays) and subjects presented to a convenient survey site between 0800 and 1100 hours. Examination was carried out by the authors.

Subjects were measured for height without shoes, standing erect on a flat surface with the gaze horizontal and the measurement taken to the nearest centimeter⁽¹⁵⁾. Weights were recorded in kilograms (to the nearest 0.5kg) with the subjects clad in minimum clothing using a flat scale on a firm horizontal surface⁽¹⁵⁾. 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 meters (m²). Waist circumference was measured (with a dress maker's tape) as the horizontal level at the midpoint between the iliac crest and the lower costal margin (with minimal clothes on)⁽¹⁵⁾. Hip circumference was recorded at the horizontal level of maximum circumference around the buttocks to the nearest 0.5cm⁽¹⁵⁾. Waist-to-hip ratio (WHR) was calculated by dividing the waist by hip circumference. A WHR of >0.85 considered as abnormal for females, while 0.79 considered as abnormal for males^(13,15).

Criteria for Diagnosis of Overweight and Obesity

Overweight and obesity were diagnosed according to WHO recommended standards^(13,14). Subjects with BMI $<20\text{kg/m}^2$ were regarded as being underweight those with BMI $20\text{--}25\text{kg/m}^2$ as being normal, those with BMI $>25\text{kg/m}^2$ as being overweight or obese and those with BMI $>30\text{kg/m}^2$ being definitely obese.

Statistical Methods

Data were analyzed using the EPI-INFO statistical programme⁽¹⁵⁾. Means (+SD) were used to describe continuous variables and proportions were used for categorical data. When comparing groups of subjects, the χ^2 (chi-square) test was applied to determine the significance of the differences observed. In all cases, p-values < 0.05 were considered as significant. WHR were divided into four groups based on quartiles of distribution in the total survey sample. Linear trends in proportions across BMI groups were assessed with χ^2 test with Mantel extension. Multiple linear regression analyses were used to determine the relationship between age, BMI and WHR.

Results

The age and sex distribution of the study subjects is shown in table 1. There was no significant difference in the age distribution of males and females, $\chi^2 = 7.34$, $p > 0.05$. The mean (SD) age of the respondents was 38.18 (16.62) years. The mean (SD) ages of males and females were 36.41 (15.74) and 39.86 (17.26) years respectively, $p < 0.01$.

Body - Mass Index (BMI)

The distribution of BMI by age group in male and female subjects is shown in table 2. Overall, the mean (SD) BMI of the respondents was 22.54 (3.66) kg/m^2 . The mean (SD) BMI for males and females were 22.35 (3.52) and 22.72 (3.79) kg/m^2 respectively, $t = 1.451$, $p > 0.05$ the distribution of BMI by sex of subjects is shown in table 3. Overall, 24.6% of the subjects had BMI $<20\text{kg/m}^2$. More than half of the subjects (53.9%) had BMI between 20 and 25 kg/m^2 , while 21.4% were

overweight or obese (BMI > 25kg/m², of which 4.2% were definitely obese (BMI > 30kg/m².)

Waist-to-hip Ration (WHR)

Waist-to-hip ration were divided in four groups based on quartiles of distribution in the study sample (table 4). In the upper quartiles for males and females were subjects with WHR >0.91 and >0.95 respectively, while in the lowest quartiles were subject with WHR <0.84 and <0.85 (males and females respectively). The mean (SD) WHR for males and females were 0.89 (0.06) and 0.87 (0.06) respectively, $t = 4,785$, $p < 0.001$. The relationship between WHR and age was very poor and insignificant ($r = 0.03$).

Prevalence of Overweight and Obesity

The distribution of the prevalence rates of overweight and obesity was 21.4% (males 19.4% and females 23.5% M:F = 1:1.3, $p < 0.05$) females having significantly more overweight and obese subjects than males. The prevalence of overweight alone (BMI >25<30kg/m² in males and females were 15.4% and 19.0% respectively, $p < 0.05$. Definite obesity was observed in 4.0% and 4.5% of males and females respectively.

The highest incidence of overweight and obesity were observed in the 35-44 years age group in both sexes. Overweight and obesity appear to be less common at the extremes of ages in the sample than in the middle ages. There were no obese subjects in the age group 15-24 years in both sexes. In subjects >65 years, of 29 males only 3.5% were definitely obese and of 40 females, no obese.

All the overweight and/or obese subjects had abnormal WHR and BMI correlated positively and significantly with WHR ($r = 0.64$, $p < 0.001$).

Discussion

In Africa where nutritional problems and disorders abound, emphasis has been on under-nutrition and starvation. Over-nutrition as an example of malnutrition has not been investigated to a similar extent as under-nutrition.

Earlier surveys were conducted among randomly selected African subjects in South Africa in 1960 and 1968. Slome et al⁽¹⁷⁾ referred the weights of their subjects to the earlier actuarial tables (Association of Life Insurance Medical Directors and Actuarial Society of America, 1912). In Nigeria, Johnson T.O. in 1970⁽⁴⁾ in a survey among randomly selected urban adult Nigerians in Lagos referred the weights of his subjects to similar American average weight tables. In all these earlier studies, they found overweight and obesity to be commoner in females than in males, a finding that is similar to the one in this study. Slome et al⁽¹⁷⁾ referring to the 1912 American actuarial table, found the overall incidence of obesity among their 325 subjects age >20 years to be 27.7%, a figure which was higher than, though not comparable to, 6.9% obtained on Nigerian subjects in Lagos but of similar age in 1970 on the 1959 actuarial tables⁽¹⁴⁾. In this study, using the body-mass index and WHO standards the prevalence of obesity in the age-group >25 years was 5.8%.

The earlier Nigeria study⁽⁴⁾, 4.3% of 440 males and 26.5% of 476 females were overweight, while 3.1% and 14.9% of males and females respectively were obese. These findings differ markedly from the observations in this study, where although, there were more overweight females than males (19.0% versus 15.4%), the difference was not as wide as in the earlier study. The prevalence of obesity in our study (males 4.0%, females 4.5%) was not significantly different in both sexes. These sharp differences on the figures obtained in Lagos (1970) and Jos (1995) may be due to ethnic variations; South western Nigeria women being generally heavier than their Northern Nigerian counterparts. The prevalence rates of overweight and obesity were higher in our male subjects compared to the Lagos male subjects (1970). This may also suggest that Northern Nigerian males are generally heavier than their South western counterparts. These observations are by no means definite as further or more studies may be required to confirm the differences.

Few African studies have used the recent categorization according to body-mass index. McLarty et al⁽¹⁴⁾ in a survey to determine the prevalence of diabetes in 6 Tanzanian villages (1989), used BMI to determine overweight and obesity, based on WHO standards. Of 6021 healthy subjects they found 42.6% with BMI <20kg/m² (under-weight), 51.0% with BMI 20-25kg/m² (normal weight), 5.6% with BMI between 25 and 30kg/m² (overweight) and a very meager 0.7% with BMI > 30kg/m² (obese). Their findings differ appearing to be common (and rightly so) in urban African adults than in their rural counterparts.

The highest prevalence of overweight and obesity in this study was recorded in the age-group 35-44 years, followed by 45-54 years age group (middle ages). This is similar to the finding of Johnson⁽⁴⁾ and the Southern African studies^(17,18).

Although, the prevalence of overweight and obesity appears high in this study, when compared to South African^(17,18) and American⁽⁶⁾ populations, it is infact less frequent.

Overweight and obesity are no longer infrequent phenomena among urban Nigerian adults. A primary use of weight guidelines is to provide direction for healthy persons. Thus periodic measurements of heights and weights are recommended for all patients. Weight reductions of even 5-10% can substantially improve blood pressure, serum lipid levels and glucose tolerance⁽¹⁹⁾, and reduce the incidence of diabetes⁽²⁰⁾ and hypertension⁽²¹⁻²²⁾. Preventing weight gain and overweight among persons with health weights and avoiding further weight gain among those already overweight are important public health goals. The road to prevention must be with an increased awareness of even small weight gains and the counseling of patients to modify their diet and activity patterns appropriately.

TABLE 1 Age and sex distribution of study population

Age Group Years	Males No. (%)	Females No (%)
15 - 24	110 (27.3)	90 (21.3)
25 - 34	93 (23.1)	89 (21.1)
35 - 44	85 (21.1)	92 (21.8)
45 - 54	62 (15.4)	59 (14.0)
55 - 64	24 (5.9)	52 (12.3)
65+	29 (7.1)	40 (9.3)
Total	403	422

TABLE 2 BMI by age in male and female subjects

Age group (years)	Mean BMI (kg/m ²) (+SD)	
	Males	Females
15 - 24	20.2 (2.2)	21.5 (2.6)
25 - 34	21.7 (3.0)	23.4 (4.1)
35 - 44	23.0 (5.0)	24.1 (3.8)
45 - 54	22.9 (2.6)	24.8 (4.5)
55 - 64	22.0 (3.2)	23.2 (4.3)
65+	22.8 (3.4)	22.7 (4.3)

Figures are mean (+SD)

TABLE 3 Distribution of body-mass index by sex of study subjects

BMI (kg/m ²)	Number of subjects (%)		
	Males	Females	Total (%)
<20	102 (25.3)	101 (23.9)	203 (24.6)
20 - 25	223 (55.3)	222 (52.6)	445 (53.9)
26 - 30	62 (15.4)	80 (19.0)	142 (17.2)
> 30	16 (4.0)	19 (4.5)	35 (4.2)
Total	403	422	825

X² = 2.11, p>0.05

TABLE 4 Quartiles of Waist-hip ratio by sex of study subjects

Group	WHR Quartiles (No of subjects)	
	Males	Females
1	< 0.84 (101)	< 0.85 (106)
2	0.85 - 0.86 (99)	0.86 - 0.88 (110)
3	0.87 - 0.90 (112)	0.89 - 0.92 (99)
4	>0.91 (91)	0.93 (107)

TABLE 5 Prevalence of overweight and obesity based on WHO standard

Age Group (years)	Males			Females		
	No of Subjects	% Overweight	% Obese	No of Subjects	% Overweight	% Obese
15 - 24	110	1.8	0	90	4.0	0
25 - 34	93	12.9	3.2	89	18.0	4.5
35 - 44	85	32.9	9.4	92	30.4	9.8
45 - 54	62	19.4	4.8	59	25.4	6.8
55 - 64	24	16.7	4.2	52	19.2	3.8
65+	29	3.5	3.5	40	17.5	0
Total	403	15.4	4.0	422	19.0	4.5

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