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Original Work

Prevalence of obesity and hypertension among adults in Ogbomoso, Nigeria

Isaac Olusayo Amole[Ψ] FWACP(FM), Akintayo David OlaOlorun FMCGP and Akinwumi Olayinka Owolabi FWACP(FM)

Department of Family Medicine, Baptist Medical Centre (now Bowen University Teaching Hospital) Ogbomoso, Oyo State, Nigeria

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ABSTRACT: Developing countries are now witnessing an increase in overweight; obesity and obesity-related morbidity. We determined the prevalence of obesity using the measure of body mass index (BMI) and hypertension and the association between obesity and hypertension among adults in Ogbomoso, Nigeria. A cross-sectional descriptive study of 400 adults was carried out. Participants were administered a standardized questionnaire and had measurements of weight, height and blood pressure taken. Four hundred subjects were randomly selected (221 females and 179 males) with a mean age of 48.65 ± 16.56 years. The overall prevalence of obesity was 14.75% (8.9% for males and 19.5% for females). In addition, 62.4% of the females were sedentary as compared to 50.8% of the males and the difference is statistically significant. The families of most of the subjects who were obese (88.1%) preferred high calorie diets. The prevalence of hypertension among the study population was 50.5% [49.3% for female and 52.0% for males ($p>0.05$)]. The prevalence of hypertension among the subjects who were obese was 72.9%. Obesity in this environment is particularly significant among females and is associated with hypertension, physical inactivity and the consumption of high calorie diets.

KEY WORDS: ***Body mass index; Obesity; Hypertension; Nigeria***

INTRODUCTION

Developing countries are now witnessing an increase in overweight, obesity and obesity-related morbidity.[1] Urbanization and economic development has resulted into a nutritional transition characterized by a shift to a higher caloric content of diet and/or to the reduction of physical activity, and whose consequences are changes in the body composition of the individuals.[1] About 1.2 billion people in the world are overweight and at least 300 million of them are obese.[2] The World Health Organization (WHO) projects that by 2015, worldwide, approximately 2.3 billion adults will be overweight and more than 700 million will be obese.[3]

Obesity is defined as a condition of abnormal or excessive fat accumulation in the adipose tissue of the body.[4] Body mass index (BMI), defined as the weight in kilogrammes divided by the square of height in metres (kg/m^2) is used to measure the "degree of fatness". Overweight is defined as BMI values between 25 and 29.9kg/m^2 while obesity is BMI value ≥30kg/m^2.[4] Normal weight is characterized by a BMI of between 18 and 24.9 kg/m^2.

A number of pathological disorders are associated with obesity, such as hypertension, type 2 diabetes mellitus, cardiovascular diseases, cancer, gallstones, respiratory system problems and sleep apnea.[5,6] According to World Health Organization, up to 20% of the population in developed countries may suffer from obesity-associated hypertension. Obesity-associated hypertension possibly accounts for 78% and 65% of essential hypertension in men and women respectively.[7] Hypertension is generally defined as a systolic blood pressure (SBP) of ≥140mmHg and/or a diastolic blood pressure (DBP) of ≥90mmHg.[8] Systolic and diastolic blood pressures are used to categorize an individual into normal, pre-hypertension, stage 1 hypertension and stage 2 hypertension as below:[8]

[Ψ]**Correspondence at:** Department of Family Medicine, Bowen University Teaching Hospital, PO Box 15, Ogbomoso, Oyo State, Nigeria; Phone: +2348057078851; E-mail: amoleio@yahoo.com

Classification of blood pressure for adults (JNC 7)[8]

	SBP (mmHg)	DBP (mmHg)
Normal	< 120	< 80
Pre-hypertension	120-139	80-89
Stage 1 hypertension	140-159	90-99
Stage 2 hypertension	≥ 160	≥ 100

METHODOLOGY

Approval was obtained from the Ethics Committee of the Baptist Medical Centre, Ogbomoso before the commencement of the study. The study was conducted at the medical 'out-patients' clinic between January, 2008 and July, 2008. Informed consent was also obtained from the subjects before their enrolment to participate in the study.

A cross sectional descriptive survey was used. Subjects aged 18 years and older who gave consent for the study were recruited. Pregnant women, women in the puerperium (day of delivery to 6weeks post delivery), patients with ascites and intrabdominal masses determined through history and physical examination were excluded from the study. A systematic sampling method was used to select the subjects. The list of patients who were registered each day to see the doctor at the medical out-patients' clinic was taken as a sample frame, and from a review of records, an average of 100 patients were estimated to attend the medical outpatient clinic per day during the period of the study. A sampling fraction of 10 was chosen and a simple random sampling was done to pick the first subject from the first ten patients as the starting number of the systematic sampling technique, subsequent selections were every 10th registered patient on the register. An identification sticker was placed on all selected subjects' record cards from the records office, where the sampling was done and sent to a designated consulting office for the study.

The selected subjects were screened and those who met the inclusion criteria were recruited for the study after an informed consent was sought and obtained. An identification sticker was left on all selected subjects' cards until the study was over to avoid a repeat selection.

A pre-tested questionnaire was administered by the researcher to obtain the following information: age, sex, marital status, ethnic group, religion, nationality, occupation, educational status, physical activity, family history of hypertension and family eating habits.

The weight of all the subjects was measured in kilogrammes using the Healthometer scale made by Continental Scale Corporation, USA to the nearest single decimal. The height was determined in metres using the Stadiometer scale to the nearest single decimal. The weight and height were measured with the subjects in light clothing and without shoes. Body mass index (BMI) was calculated as weight (kg) divided by height squared (m^2). Obesity was defined as body mass index (BMI) ≥ 30 kg/m^2 and overweight as 25 kg/m^2 ≤ BMI < 30 kg/m^2.

Blood pressure was measured using mercury sphygmomanometer made by Dekamet Accosson, England with appropriate cuff size and a Littman's stethoscope. Blood pressure was measured in the right arm in a sitting position after at least 15mins of rest.[9] The cuff (about 12.5cm wide) of the sphygmomanometer was applied evenly and snugly about the bare arm with the lower edge at 2.5cm above the ante-cubital fossa. A single thigh cuff (about 15cm wide) was used for all obese subjects. The cuff was inflated rapidly to about 30 mmHg above the level at which the radial pulse was no longer palpable. Thereafter the cuff was deflated slowly. As the cuff was being deflated slowly the investigator listened with a stethoscope placed over the brachial artery in the ante-cubital fossa. Three readings were taken for each subject at intervals greater than 2 minutes and the mean of the second and third readings were used in the analysis.[9] The systolic pressure was taken as the 1st phase sound of Korotkoff and diastolic was taken as 5th phase sound of Korotkoff. The observed value was recorded to the nearest 2 mmHg. Hypertension was defined as systolic blood pressure of ≥140mmHg and/or a diastolic blood pressure of ≥90mmHg[9] and/or self reports of a medical diagnosis of hypertension or current treatment for hypertension with prescription medication[10].

The subjects who engaged in leisure time physical activity (walking, fitness training and sports) for greater than or equal to three times per week of thirty minutes per occasion were classified as physically active.[11]

Subjects' diets were classified as 'high calorie' or 'low calorie' diets according to their response to the question asked them to list 5 types of food they ate most in the order of preference and their consumption of fast foods/snacks. Those who had mainly refined carbohydrate and fatty foods including preference for fast foods were classified as having high calorie diet. While those who ate less of refined carbohydrate and fatty meals, and added vegetables and fruits as part of the food they ate most, were classified as having low calorie diets.

The subjects were placed into one of the five social classes based on their occupation using the Registrar General's Scale of social classes .[12]

Class 1	Professional e.g. Lawyer, Doctor, Accountant.
Class 2	Intermediate e.g. Teacher, Nurse, Manager.
Class 3N	Skilled non-manual e.g. Typist, Shop assistant, telephone operators.
Class 3M	Skilled manual e.g. Miner, Bus-driver, Cook, artisans.
Class 4	Partly skilled (manual) e.g. Farm worker, Bus conductor.
Class 5	Unskilled e.g. Cleaner, Labourer.

Data were analyzed by computer using the statistical package for social sciences (SPSS 13).

RESULTS

A total of 400 subjects aged 18 years and older were recruited for the study. The mean age of the subjects was 48.65 ± 16.57 years and there were more female subjects (55.25%) than male subjects (44.75%). The overall prevalence of obesity was 14.75%. Obesity increased with age up to the age group 40-49 years after which it declined. The mean BMI among the subjects was 24.60 ± 5.43 Kg/m^2 (23.15 ± 4.18 Kg/m^2 for males and 25.93 ± 5.99 Kg/m^2 for females). The prevalence of obesity among the males was 8.9% while among the females it was 19.5% (**Table 1**). The prevalence of physical inactivity among the subjects was 57.3%. In addition, 62.4% of the females were sedentary as compared to 50.8% of the males and the difference is statistically significant (**Table 1**). Among the subjects who were obese, 66.1% (p>0.05) of them were physically inactive (**Table 2**). The overwhelming majority of the families of the subjects who were obese (88.1%) preferred to consume high calorie diets (p>0.05). More than one-half of the subjects who were obese (59.3%) were from social class 3N (P<0.05) (**Table 2**).
Hypertension increased with the age and the prevalence of hypertension among the study population was 50.5%. The prevalence for females was 49.3% and that for males was 52.0% (p>0.05) (**Table 1**). The prevalence of stage 1 (systolic 140-159mmHg and/or diastolic 90-99mmHg) and stage 2 (systolic ≥160mmHg and/or diastolic ≥100mmHg) hypertension were 23.5% and 20.0% respectively while the prevalence of pre-hypertension was 40.75%. (**Table 3**) The prevalence of hypertension among the subjects who were obese was 72.9% (p< 0.05) (**Table 2**).

Table 1: The association between sex, obesity, physical activity and hypertension

	Male N (%)	**Female N (%)**	**Total**	**χ^2 / P-value**
BMI Obesity				
Normal	126(70.4)	115(52.0)	241(60.2)	15.378 / 0.000
Overweight	37(20.7)	63(28.5)	100(25.0)	
Obese	16(8.9)	43(19.5)	59(14.8)	
Total	179(100.0)	221(100.0)	400(100.0)	
Physical Activity				
Active	88(49.2)	83(37.6)	171(42.7)	5.442 / 0.020
Inactive	91(50.8)	138(62.4)	229(57.3)	
Total	179(100.0)	221(100.0)	400(100.0)	
Hypertension				
Hypertensive	93(52.0)	109(49.3)	202(50.5)	0.274 / 0.600
Normotensive	86(48.0)	112(50.7)	198(49.5)	
Total	179(100.0)	221(100.0)	400(100.0)	

Table 2: The association between obesity, physical activity, diet, social class and hypertension

	Normal N (%)	Overweight N (%)	Obese N (%)	Total	χ^2 / P-value
Physical Activity					
Active	107(44.4)	44(44.0)	20(33.9)	171(42.7)	2.220 / 0.330
Inactive	134(55.6)	56(56.0)	39(66.1)	229(57.3)	
Total	241(100.0)	100(100.0)	59(100.0)	400(100.0)	
Diet					
High calorie	216(89.6)	86(86.0)	52(88.1)	354(88.5)	1.577 / 0.813
Low calorie	25(10.4)	14(14.0)	7(11.9)	46(11.5)	
Total	241(100.0)	100(100.0)	59(100.0)	400(100.0)	
Social Class					
Class 1	3(1.2)	1(1.0)	0(0.0)	4(1.0)	31.321 / 0.001
Class 2	48(19.9)	28(28.0)	11(18.6)	87(21.8)	
Class 3N	85(35.3)	51(51.0)	35(59.3)	171(42.8)	
Class 3M	13(5.4)	5(5.0)	4(6.8)	22(5.5)	
Class 4	43(17.8)	5(5.0)	2(3.4)	50(12.5)	
Class 5	49(20.3)	10(10.0)	7(11.9)	66(16.5)	
Total	241(100.0)	100(100.0)	59(100.0)	400(100.0)	
Hypertension					
Hypertensive	102(50.5)	57(57.0)	43(72.9)	202(50.5)	19.958 / 0.000
Normotensive	139(57.7)	43(43.0)	16(27.1)	198(49.5)	
Total	241(100.0)	100(100.0)	59(100.0)	400(100.0)	

Table 3: Prevalence of hypertension

Hypertension	Frequency	Percentage
Normal	61	15.25
Pre-hypertension	163	40.75
Stage 1 hypertension	94	23.50
Stage 2 hypertension	82	20.50

DISCUSSION

It was discovered from this study that obesity increased with age up to age group 40-49 years after which it declined. This is similar to what was found in Rivers State, Nigeria by Siminialayi et al[13] where they found that obesity was more common among subjects older than 40 years. The prevalence of obesity among our subjects was 14.75%. The prevalence of obesity found in this study is comparable with 16.3% found in Okrika, Rivers State, Nigeria by Siminialayi et al.[13] The prevalence of obesity among the males was 8.9% while it was 19.5% among the female. The high prevalence of physical inactivity among the female subjects is one of the factors that may be responsible for the high prevalence of obesity found among the female subjects in this study. This

is supported by the findings of Roger et al[14] in the North West Province, South Africa where they investigated the association between measures and determinants of obesity in African women. They found that physical inactivity showed the strongest association with measures of obesity in their study. The fact that more than one-half (53.3%) of the subjects who were obese were traders ($p<0.05$) and that the female subjects constituted the overwhelming majority (82.5%) of the subjects who were traders ($p<0.05$) is another reason for the high prevalence of obesity found among the female subjects. Most traders in Ogbomoso spend most of their time sitting down in their shops and engaging in predominantly sedentary activities. This strong association between obesity and trading was also supported by the findings of Afolabi et al[15] in their study in nearby Abeokuta, Ogun State, Nigeria. Physical inactivity was the reason given by Afolabi et al.[15] In addition, consumption of high calorie diets is one of the major contributory factors to the development of obesity and this has been corroborated by this study where the majority of the families of the subjects who were obese (88.1%) preferred starchy food. However, contrary to the findings of many studies where obesity was strongly associated with high socio-economic status, more than one half of the subjects who were obese (59.3%) were from the social class 3N. This observation may be as a result of low representation of the subjects from social class 1 in Ogbomoso where they constituted only 1% of the total study population.

This study also showed that hypertension increases with the age and the subjects from the age group ≥70 years had the highest percentage (76.1%) of hypertension ($p<0.05$). This is not surprising because it has been established that age is one of the predisposing factors to the development of essential hypertension. The findings in Ogbomoso are in agreement with the findings of Olatunbosun et al[16] in their study in Ibadan, Nigeria where they found that age is a risk factor for the development of hypertension in the urban black population. The overall prevalence of hypertension among the study population was 50.5%. The reason for the high overall prevalence of hypertension in this study is probably because the study was carried out in a medical outpatient clinic where hypertension is one of the leading disease entities. The 50.5% overall prevalence found in this study is at variance with the result obtained by Omuemu et al[17] in Edo State, Nigeria, Bektas et al[18] in Ghana and Olatunbosun et al[16] in Ibadan, Nigeria, where they found overall prevalence rates of 20.2%, 26.8% and 10.3% respectively. The fact that these studies were community-based studies may be one of the reasons why they obtained lower overall prevalence of hypertension. The difference in the cut-off point for hypertension is another major reason for the difference in the prevalence rates of hypertension. Olatunbosun et al[16] used ≥160/95 as the cut-off for hypertension while ≥140/90 was used in this study. The prevalence of pre-hypertension (40.75%) was much higher than that of stage 1 (23.5%) and stage 2 (20.0%) hypertension in this study. Lifestyle modification, which is the main treatment modality in pre-hypertension, has been shown in several studies to have the potential to prevent hypertension and lower the risk of blood pressure-related clinical complications in the whole population.[8,19] Therefore, there is need to promote lifestyle modification in Ogbomoso in order to prevent the subjects who had pre-hypertension from progressing to stage 1 or stage 2.

The higher prevalence of hypertension in men in spite of a much higher rate of obesity in woman found in this study is similar to the findings of Olatunbosun et al[16] in Ibadan, Nigeria where they found that men had higher prevalence of hypertension than women in spite of higher level of obesity among women. This finding is not surprising in a black population because it has been documented that male sex is a risk factor for hypertension in most black populations.[16]

CONCLUSION

The findings from this study have suggested that obesity in this environment is particularly significant among females and is associated with hypertension, physical inactivity and the consumption of high calorie diets. Therefore, there is need to promote lifestyle modification in Ogbomoso in order to stem the increasing prevalence of obesity and its associated complications.

The measurement of BMI should be made a routine procedure in the health care facilities. This will help in the early detection of patients who are overweight or obese before they develop complications associated with obesity.

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