Relationship Between BMI And Blood Pressure In Rural Nigerian Dwellers

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Citation

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Abstract

Hypertension places an excessive financial burden on populations and health systems, consuming scarce resources. Population based preventive approaches are, thus central for the management of elevated blood pressure in developing countries. This cross sectional study was carried out in the Buruku Local Government of Benue State in the middle belt of Nigeria. The body weight, height and blood pressure of 423 subjects were determined. BMI was calculated as weight divided by height squared and hypertension was defined using the JNC VII criteria. The male subjects were significantly taller, heavier and also had significantly higher SBP and DBP than the female subjects. The prevalence of hypertension was higher in the male than the female subjects. There was a positive correlation between the BMI and SBP and DBP. Basic measurement of weight and height to determine the BMI as a routine assessment during clinic visitation with appropriate lifestyle modification would help in controlling hypertension as well as reduce its prevalence and its subsequent financial burden.

INTRODUCTION

The relationship between body mass and blood pressure has been established more than 70 years ago [1]. Both cross-sectional and longitudinal studies [2,3,4,5] in Western populations have consistently identified an association between overweight and hypertension. Several clinical trials have also shown an effect of weight reduction in lowering blood pressure [6,7,8]. Body weight adjusted for height is often used as an alternative to the measurement of adipose tissue mass in the evaluation of individuals or populations for obesity [9]. One such measure in widespread use is Quetelet's index, which is body weight (in kg) divided by height (in m^2) [9]. Better known as body mass index or BMI, this measure is promulgated by the World Health Organization as the most useful epidemiological measure of obesity.

Body mass index (BMI) is positively and independently associated with morbidity and mortality from hypertension, cardiovascular disease, type II diabetes mellitus and other chronic diseases [10]. A strong association has been depicted between BMI and mortality in Caucasians. [11,12] A similar association has also been demonstrated among Asian populations [13,14,15]. The significant positive association between BMI and both SBP and DBP has been reported in studies of African-Americans [16], Chinese [17,18], Africans and Caribbeans [19].

Developing countries are increasingly faced with the double burden of hypertension and other cardiovascular diseases, along with infection and malnutrition. Hypertension places an excessive financial burden on populations and health systems, consuming scarce resources. The relationship between BMI and hypertension is of particular interest to developing countries as excess cardiovascular mortality among lean hypertensive subjects has been reported in some longitudinal studies [20,21,22]. Population based preventive approaches are, thus central for the management of elevated blood pressure in developing countries, where clinic based care for complications is not a readily available option. This study intends to generate relevant information that helps to understand the different patterns of high blood pressure in population where the prevalence of obesity is growing. Such information would thus be relevant to the prevention and control of hypertension in developing countries.

MATERIALS AND METHODS

This cross-sectional study was carried out in the Buruku local Government of Benue state in the middle belt of Nigeria. The state is known as the food basket of the nation since majority of its inhabitants are farmers, with students and civil servants constituting the rest. After adequate education on the purpose of the study, those who gave their consent were recruited into the study. Recruitment was done at the medical outpatient unit of the Primary Health Center.

Pregnant women and any individual with gross physical deformities were excluded from the study. The ethical committee of Benue State University College of Health Sciences gave approval for the study.

After obtaining oral consent, blood pressure was measured on left arm by auscultatory method using mercury sphygmomanometer. The individual was made comfortable and seated at least for five minutes in the chair before measurement. Hypertension was defined as systolic blood pressure (SBP) >140 mmHg and/or diastolic blood pressure (DBP) >90 mmHg as per US Seventh Joint National Committee on Detection, Evaluation and Treatment of Hypertension (JNC VII) criteria [23].

Body weight was measured (to the nearest 0.5 kg) with the subject standing motionless on the bathroom weighing scale [24]. Each weighing scale was standardized every day with a weight of 50 kg. Height was measured (to the nearest 0.5 cm) with the subject standing in an erect position against a vertical scale of portable stadiometer and with the head positioned so that the top of the external auditory meatus was in level with the inferior margin of the bony orbit. BMI was calculated as weight in kilograms divided by squared height in meter. Conventional BMI cutoff points were applied to classify the study populations into underweight (BMI<18.5 kg/m^2), normal BMI (18.5≥BMI<25 kg/m^2) and overweight (BMI≥25 kg/m^2). The statistical software SPSS (version 10) was use for data analysis. The mean values of weight, height, BMI and BP was determined. Correlations between continuous variables were examined using correlation coefficients.

RESULTS

A total of 423 subjects with male of 206 (44.9%) and female of 217 (55.1%) participated in the study. The female subjects were older than their male counterpart. The majority of the subjects were farmers constituting 51.1% of the study population (Table 1).

Figure 1

Table 1: Occupational Distribution of Studied Population

OCCUPATION	FREQUENCY	PERCENTAGE (%)
Artisan	11	2.6
Civil Servants	10	2.4
Farmers	216	51.1
Students	154	36.4
Unemployed	8	1.9
Total	423	100

The male subjects were significantly taller and heavier than the female subjects, although there was no difference between their BMI. The male subjects also had significantly higher SBP and DBP than the female subjects (Table 2).

Figure 2

Table 2: Baseline characteristics of study population by sex

Characteristics	Men (m±sd)	Women (m±sd)	Pvalue
Number of subjects	206	217	
Age (yr)	31.2±15.7	36.3±19.4	0.002
Height (m)	1.68±0.07	1.58±0.07	0.000
Weight (kg)	60.1±8.7	53.0±8.9	0.000
Body mass index (kg/m^2)	21.2±2.8	21.2±3.5	0.901
Systolic blood pressure (mmHg)	130.1±17.7	123.8±16.4	0.000
Diastolicblood pressure (mmHg)	80.9±14.2	75.3±11.5	0.000

Sixteen (7.8%) of the women were overweight while 22 (11.2%) of the men were overweight, although there was no statistical difference in the BMI between the sexes. The prevalence of hypertension was higher in the male than the female subjects (Table 3).

Figure 3

Table 3: Prevalence of overweight and high blood pressure among studied subjects

Characteristics	Men (n=206) Number (%)	Women (n=217) Number (%)
BMI		
<18.5	27(13.1)	38(17.5)
≥18.5-<25	163(79.1)	157(72.3)
≥25	16(7.8)	22(11.2)
SBP		
<140	146(70.9)	170(78.3)
≥140	60(29.1)	47(21.7)
DBP		
<90	133(64.6)	178(82)

There was a positive correlation between the BMI and SBP and DBP. When the age was compared with BMI, SBP and DBP, there was a poor correlation between the age and BMI for both sexes (negative for male), while the weak correlation with SBP and DBP only achieved significant difference with SBP in female and DBP in male (Table 4 and 5).

Figure 4

Table 4: Correlation coefficient of BMI with SBP and DBP in male and female subjects studied

	SBP	DBP
Male	0.163	0.165
Female	0.211	0.192

Note: All correlation are significant at p<0.05

Figure 5

Table 5: Correlation coefficient of age with BMI,SBP and DBP in female and male subjects

	BMI	SBP	DBP
Male	-0.053	0.066	0.172*
Female	0.048	0.341*	0.110

Note: *Significant correlation at p<0.05

DISCUSSION

In this study we examined the relationship between BMI and BP among rural dwellers in middle-belt region of Nigeria. The study sample composed of rural population majority of who were farmers, thus findings in this study population may be much different from the situation at the national level.

A significant positive correlation between BMI and SBP or DBP was observed in this population though the correlation coefficient was weak (0.3). The correlations were comparable between the two genders. Significant correlation of BMI to SBP and DBP was observed in studies in Ibadan [25] and Tanzania [26] . In a study that examined ethnic differences in the strength of association between BMI and hypertension, higher prevalence of hypertension was associated with higher BMI levels in different ethnic groups [27] . Significant associations between BMI and BP have also been documented in lean Chinese populations [14,28] .

The association between BMI and BP has been widely reported across populations in Asia, Latin America, United States and Canada. In a study that included five Latin American populations (urban) and seven Asian populations (four urban, three rural), significant positive relationships of similar magnitude were observed between BMI and BP, despite differences in mean BMI levels between the populations studied [18,29] .

In our study SBP and DBP were positively correlated with age while BMI was not or negatively correlated. Thus, BP increases with increasing age, while BMI did not change significantly. A significant correlation between SBP and age was also reported in India [30] .

The prevalence of underweight/undernutrition in this study population was comparable to that found in Indonesia population, but low to that found among men and women in Ethopia and Vietnam [31] . The cumulative exposure to poverty and diseases, and nutritional deprivation throughout childhood, adolescence and adulthood might contribute to progressive decline of the BMI. Declining economic opportunities and lack of access to health and other social services are commonly encountered in low-income settings, which may also account for the low BMI in such populations. Based on the JNC VII [23] classification of hypertension, the prevalence of undiagnosed or untreated hypertension was more among the male subjects than the female subjects, a finding similar to the pattern in rural Indians [32] which is also a third world country like Nigeria.

In conclusion there is significant correlation between BMI and DBP or SBP among Nigerian rural dwellers, thus basic measurement of weight and height to determine the BMI as a routine assessment during clinic visitation with appropriate lifestyle modification would help in controlling hypertension as well as reduce its prevalence.

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