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WEIGHT THRESHOLD BMI AND HYPERTENSION AMONG THE ELDERLY NIGERIANS IN MIDDLE BELT: THE LAFIA EXPERIENCE

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ABSTRACT

Aim: This work is aimed at elucidating the weight threshold and blood pressure above which these relationships exist and cofounders of metabolic state. **Background:** High blood pressure is one of the risk factors for cardiovascular disease. The relationship between BMI and BP has long been the subject of epidemiological research. Metabolic consequences of obesity have been proposed as the blood elevating mechanism. Increasing weight has been shown to increase salt retention, and insulin resistance is proposed by some to be a cause of hypertension; adipose tissue (adiposopathy) produces substantial of angiotensin. A study in Benin Nigeria revealed that the is a threshold above which little relationships exist and cofounders of metabolic state. **Materials and Methods:** This is a cross-sectional study of 700 adults above 40 years were selected by random sampling technique. The body mass index (BMI) was calculated using the WHO definitions: BMI/kg >30 kg/m_2 was defined as obesity while participants with a BMI of 25.0 and 29.9 were considered overweight. Underweight individuals were those with a BMI<18.5 while normal-weight individuals were those with a BMI between 18.5 and 24.9. Obesity was further sub-classified into class 1(30-34.9 kg/m^2) and Class III (>40 kg/m). Hypertension was noted if systolic blood pressure ≥ 130mmHg and diastolic of ≥ 90mmHg or upon the self-report of a medical diagnosis of hypertension or current treatment for hypertension with prescription medication. **Conclusion:** There is a significant correlation between BMI and DBP or SBP among middle belt retirees, thus the basic measurement of weight and height to determine the BMI should form a routine assessment during clinic visitation with appropriate lifestyle modification would help in controlling BP and weight. Point of care use of portable electronic BP machine is important as well as regular exercise.

KEYWORDS: *BMI = Body Mass Index; BP = Blood Pressure; obesity.*

1. INTRODUCTION

In developing countries, high blood pressure is one of the risk factors for cardiovascular diseases, the estimated 7.1 million deaths especially among middle, and old age adults are due to high BP.[1]

Based on the seventh report the Joint National Committee on Prevention, Detection, Evaluation and Treatment of High Blood Pressure[2], normal BP is defined as less than 120/80 mmHg, pre-hypertension as 120-139/80 mmHg, stage 1 hypertension as 140-159/90-99 mmHg, and stage 2 hypertension as equal to and above 160/100 mmHg.

The relationship between BMI and BP has long been the subject of epidemiological research. Positive association BMI and BP have also been reported among Asian populations.[3-5]

Greater fat stores and its associated direct metabolic consequences, persons with higher BMI values consume more sodium.[6,7] and engage in less physical activity.[8] Physical activity can have a substantial effect on blood pressure.[9] There is a weight threshold above which blood pressure is observed in Africa population. Hypertension is almost silent in lean, very lean rural Africa population and very common in predominantly obese westernized black population.[5,10,11]

Metabolic consequences of obesity have been proposed as the blood elevating mechanism[12] Increasing weight has been shown to increase salt retention,[13,14] and insulin resistance is proposed by some to be a cause of hypertension; adipose tissue (adiposopathy) produces substantial amounts of Angiotensin.

The burden of cardiovascular disease is high in South Asian countries in their process of economic development.[10] Several studies indicate that high BP is associated with age and is also because of the process of modernization.[11,15] In a process of rapid economic development and modernization with changing lifestyle factors has an increasing trend of hypertension, especially among the urban population.[16]

Around the world, traditional populations often have low blood pressure (<120/80 mmHg) and show little increase with age.[17] Similarly, in India, the traditional tribes and caste groups, which represent a substantial percentage of the country's population, are believed to have lower BP was noted.[18]

A study in Benin Nigeria revealed that the is a threshold above which little relationship exists between Blood pressure and weight is observed.

This work is aimed at elucidating the weight threshold above which these relationships exist and cofounders of metabolic state.[15,16,19,20] (age, sex, lifestyle).

2. MATERIALS AND METHODS

2.1 Study Design and Setting

This is a cross-sectional retrospective study done at Shalom Hospital, a private Secondary Health Facility in Lafia town. Lafia town is a fast-growing town in the middle belt Nigeria, dominated by retirees and few farmers.

2.2 Sample and Sampling Method

The study population consists of 700 adults above 40 years selected by random sampling technique. Both females and males were recruited into the study.

The study was usually done between 8:00 and 15:00hrs after an overnight fast between the year 2010 and 2017.

On arrival at the study venue, each subject was allowed to rest for about 10min; socio-demographic data and history of personal habits such as alcohol consumption and cigarette smoking were obtained.

Brief health education was given.

Weight was measured using a portable weighing scale (stadiometer) while a meter rule used in the measurement of height. Both were taken in a standing position with shoes, and heavy clothing removed. The body mass index (BMI) was calculated using the WHO definitions: BMI>30kg/m_2 was defined as obesity while participants with a BMI of 25.0 and 29, 9 were considered overweight. Underweight individuals were those with BMI<18.5 while normal-weight individuals were those with a BMI between 18.5 and 24.9. Obesity was further sub-classified into class I (30-34.9 kg/m^2), class II (35-39.9 kg/m^2) and Class III (>40 kg/m^2).

The body mass index (BMI) was calculated and recorded. Classification by BMI was done according to the recommendations of the WHO expert committee for the classification of overweight.

The aneroid sphygmomanometer was used in the measurement of blood pressure. Blood pressure was measured in the right arm after at least 15 min of rest and while participants were sitting down. The participants must abstain from eating, smoking tobacco or taking alcoholic beverages for at least 30 minutes before the measurements. Hypertension was noted if systolic blood pressure 130 mmHg, or upon the self-report of a medical diagnosis of hypertension or current treatment for hypertension with prescription medication.

Venous blood was taken for assay using the principle of glucose oxidase method as shown below; five mls of venous blood was taken for assay. Blood glucose and uric acid were determined for each subject by using glucose oxidase and uricase enzymatic method.

2.3 Principle

Glucose is determined after enzyme oxidation in the presence of glucose oxidase. The hydrogen peroxide formed reacts under the catalysis of peroxidase, with phenol and 4-aminophenazone to form a red-violet quinone imine dye as an indicator

2.3.1 Reaction principle

Glucose + O_2 + H_2O =>Gluconic acid + H_2O_2

H_2O_2 + 4-aminophenazone + phenol =>quinoneimine + $4H_2O_2$

2.3.2 Normal values

Serum, plasma, (fasting): 4.2-6.4mmol/L of 75/115mg/dl

2.4 Statistical Analysis

Pearson chi-square will be used for nominal and the independent samples test for continuous variables. A value below 0.005 was considered significant

3. RESULTS

Characteristics of study participants according to their quartiles.

The analysis was conducted on 700 individuals who had both BMI, GLU, Uric acid and blood pressure assessment. The mean age of the individuals was 63.63 years and approximately 43% were male and 57% female.

The weight (BMI) threshold is found to be 26.5 kg/m^2 and BP = 135/90 mmHg.

Table 1. Characteristics of study participants according to their quartiles(30).

Characteristics	1ST Quartile	2ND Quartile	3RD Quartile	4TH Quartile	P-Value
	≤0.2	0.2-0.24	0.25-0.29	≥0.30	
Age	47.5±7.5	59±3	85±5	110±10	<0.0001
BMI	19.58±2.64	23.40±1.05	26.52±2.06	33.73±4.84	<0.0001
SBP	110±10	120±5	135±5	160±20	<0.0001
DBP	75±5	80±5	90±5	110±10	<0.0001

Table 2: Partial Spearman correlation coefficients among Uric acid, blood pressure, Body Mass Index and GLU(31).

	Uric acid	BMI	SBP	DBP
BMI	0.1453			
SBP	-0.0394	-0.0740		
DBP	-0.0758	-0.0767	0.7561	
GLU(F/R)	0.1265	0.0108	0.0972	0.0250

Table 3: BMI Class and population.

	Underweight	Normal	Overweight	Class I Obesity	Class II Obesity	Class III Obesity
	< 18	18-24	25-29	30-34	35-39	≥ 40
Population	37	224	574	50	28	3
% Population	4.03	24.43	62.60	5.45	2.73	0.53

3.1 Associations

Partial Spearman correlation analysis demonstrated the strongest association between Uric acid and body mass index (BMI) and GLU. It also signifies a low correlation between uric acid and blood pressure. BMI had a very little relationship with GLU, so also SPB and GLU and DBP and GLU. SBP and DBP had a very strong Correlation from the data analyzed.

From the table overweight have the highest percentage population of 62.6 Class I (2.73%) with least in Class II (0.3%).

3.2 Histograms

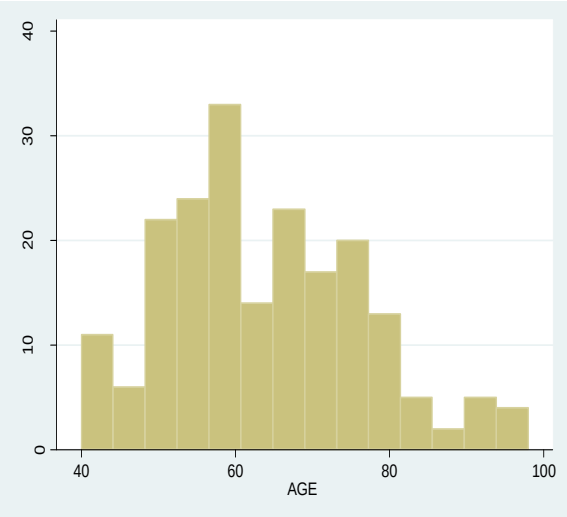

Fig. 1.

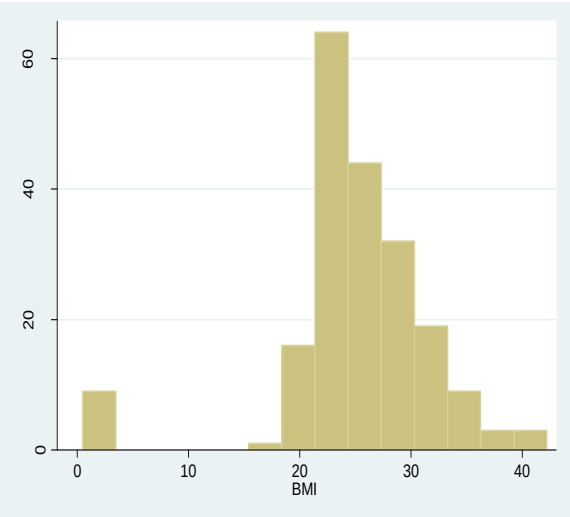

Fig. 2.

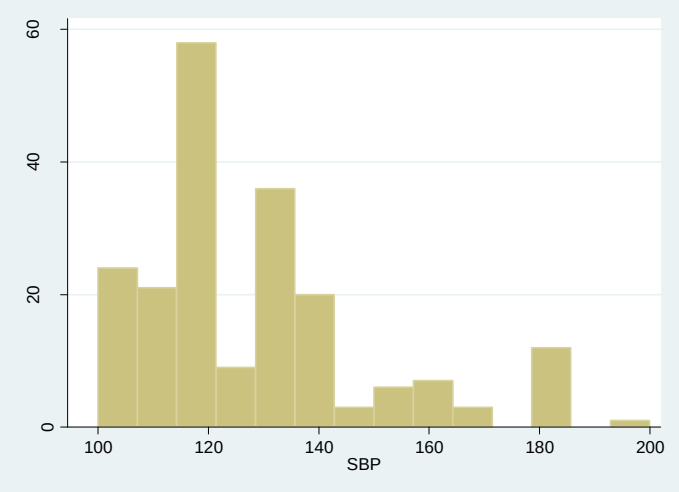

Fig. 3.

4. DISCUSSION

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. Positive associations between body mass and BP. Some studies have been documented as consistent, but modest association.[20]

The relationship between BMI and hypertension is of particular interest to developing countries as excess cardiovascular mortality among lean hypertension subjects has been reported in some longitudinal studies[21,22,2,23] other studies that have examined the relationship between body weight and cardiovascular mortality also reported a curvilinear relationship with increased risk or mortality among the very lean and very overweight.[24,6,7]

Age was positively correlated with BMI and both systolic and diastolic blood pressures. Systolic and diastolic blood pressures increased with age steadily from the youngest to the oldest age group showing the independence of BP on age. Earlier studies also indicated that high BP is associated with age.[15,25,13] In the present study, the association of age with systolic and diastolic blood pressures was stronger than that of age with BMI. Thus the association of systolic and diastolic blood pressures was stronger than that of age with BMI. Thus, the association of systolic and diastolic BP with age was more significant than that of BMI with age.

Correlation analyses between BMI and BP showed significant positive correlations between them. When the mean systolic and diastolic blood pressure increased among, different BMI from lowest BMI to the highest BMI category. Both systolic and diastolic BP increased with increase in BMI level. In a study conducted among Punjabi girls of Delhi, a significant correlation of BMI with blood pressure was also found. The positive association between BMI and BP have also been reported in other Indian population.

The present study showed BMI as a strong predictor of blood pressure. Kumunyika, et al. have shown body mass index to be even more strongly related than the race to blood pressure and that its effect is similar across surveys in the United State and within sex and racial groups. Several investigators have concluded that among many relevant factors body mass index is one of the most important predictors of blood pressure.

Underweight subjects were less likely to have high blood pressure than those who were in the normal BMI category. Overweight or obese subjects were more likely to have a significantly higher blood pressure than those with normal BMI in all the three stages of pre-hypertension, stage I hypertension and stage II hypertension.

The study demonstrated that body mass index is closely associated with both systolic and diastolic blood pressure among the middle belt associated with rising age independently. Thought the magnitude of correlation differed, there was a positive and significant correlation among BMI, age systolic and diastolic blood pressure.

5. CONCLUSION

There is a significant correlation between BMI and DBP or SBP among middle belt retirees, thus basic measurements of weight and height to determine the BMI should form a routine assessment during clinic visitation with appropriate lifestyle modification would help in controlling BP and weight. Point of care use of portable electronic BP machine is important as well as regular exercise.

CONSENT

Individual consent was obtained from all recruited individuals.

ETHICAL APPROVAL

Ethical clearance was obtained from the research and ethical committee of Jos University Teaching Hospital.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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