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BODY MASS INDEX AND BLOOD PRESSURE CONTROL AMONG HYPERTENSIVE PATIENTS ATTENDING THE FAMILY MEDICINE CLINIC OF LAGOS STATE UNIVERSITY TEACHING HOSPITAL (LASUTH)

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Abstract

Background: Hypertension is one of the most common chronic diseases in the world, contributing to cardiovascular disease and early death worldwide. The reduction of complications from hypertension lies in achieving blood pressure control. Body mass index is a predictor of both hypertension and blood pressure control.
AIM: This study aimed to determine the relationship between body mass index and blood pressure control among hypertensive patients attending the Family Medicine clinic, LASUTH to address issues of uncontrolled blood pressure.
Methodology: This was a descriptive cross-sectional study involving 384 consenting hypertensive adults who were selected using systematic random sampling method. An interviewer-administered semi-structured questionnaire was used to obtain relevant data. Data was analyzed using SPSS 27.
Results: The age range of the participants was 28-87 years, 59.6% of the participants had good blood pressure control. 67.2% of the participants had abnormal BMI: 49.2% overweight, 16.4% obese, and 1.6% underweight. Underweight and obesity were associated with Uncontrolled BP (p-<0.001).
Conclusion: This study showed that underweight and obesity components of the BMI are associated with uncontrolled BP, hence plans for achieving normal weight should be incorporated early in the management of hypertensive individuals.

Keywords: Body mass index, Blood pressure control, Hypertension

INTRODUCTION

Hypertension is defined by the Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (JNC 7), as a persistent sustained systolic blood pressure of greater than or equal to 140mmHg and or diastolic BP of greater than or equal to 90mmHg.[1] Hypertension is a non-communicable disease estimated to affect 1.13 billion people globally of which two-thirds are living in low- and middle-income countries like Nigeria.[2] It accounts for 10.7 million deaths from stroke, ischemic heart disease, other vascular diseases, and renal disease worldwide.[3] Poor blood pressure (BP) control is the major cause of these complications which is seen more in low and middle-income countries like Nigeria.[3, 4]

Blood pressure control is defined as systolic blood pressure of less than 140mmHg and diastolic BP of less than 90mmHg. Identified causes of poor BP control poor medication adherence and poor lifestyle habits. These habits include high salt intake, high-fat dairy products and polysaturated diet, less intake of fruits, vegetables, and fiber diet; poor physical activity, poor stress management, cigarette smoking, alcohol consumption and poor weight management.[3]

Body mass index (BMI) is used to classify average body weight using the Quetelet equation which measures body weight and height (weight in Kg/height 2 in meters).[5, 6] Using the WHO classification system, BMI was divided into four classes, and they include underweight (below 18.5), Normal weight (18.5-24.9), overweight (25-29.9), and Obesity (above 30).[6] Most studies have looked at how obesity influences blood pressure control but have not looked at the other BMI classes, especially underweight. It is of note that being underweight also impacts hypertension control negatively, causing early premature death.[7] This study aimed to assess the prevalence of four categories of BMI and how each class influences blood pressure control. Also, the high prevalence of obesity and hypertension in Nigeria, which is respectively 14.5% [8] and 30.6% [9], necessitates the need for good BP control.

METHOD

This study was a cross-sectional study carried out at the family medicine outpatient clinic of The Lagos State University Teaching Hospital (LASUTH) between October and December 2022. Three hundred and eighty-four consenting adults with hypertension were drawn from the following clinics under the Family Medicine Outpatient Clinics (Chronic Medical Disorder Clinic, the Lifestyle Medicine Clinic and the Care of the Older Person's Clinic). Ethical approval was obtained from the Health and Research Ethics Committee of LASUTH with HREC number LREC/06/10/1748. The participants were provided with both written and verbal information regarding the study. The study participants signed informed consent forms, and they were free to withdraw from the study at any time.

The inclusion criteria comprised adult patients diagnosed with hypertension who were aged greater than or equal to 18 and had been on antihypertensive medications for at least three months. Also, they had been attending the clinic for a minimum of one month, such that their previous one-month blood pressure was known and recorded in their case files.

The exclusion criteria were: a. patients with secondary hypertension; b. patients with cognitive impairment who cannot give informed consent; and c. those who came in as an emergency or were too ill to follow the study protocol.

The following demographic, clinical and anthropometric information was collected using an interviewer-based questionnaire: age, gender, education, occupation, monthly

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DATA ANALYSIS

Data entering, cleaning, and analysis were done using the Statistical Package for Social Sciences (SPSS) version 27. Mean and standard deviation were used to present normally distributed continuous data. Frequency, percentages, and charts were used to present categorical data. Chi-square was used in bivariate analysis to assess the association between categorical variables. Blood pressure control was the dependent variable, while the independent variable was body mass index. The level of statistical significance was set at a p-value < 0.05.

RESULTS

A total of three hundred and eighty-four (384) participants with hypertension were recruited from the Family Medicine clinics into the study for three months, with an age range of 28-87 and a mean age of 56.23±12.3. Participants were more females giving a female-to-male ratio of 1.14 :1. About three-fifths of the participants were of the Yoruba ethnic group. Most of them had tertiary education, with more being self-employed, earning between 100,000 to 200,000 naira monthly.

A summary of the socio-demographic characteristics is displayed in Table 1 below.

The participants were overweight, and over half of them had dyslipidemia. They had less number who smoked cigarettes or consumed alcohol. A huge number of them took fruits and vegetables, but few of them engaged in physical activity.

Details of the clinical and lifestyle characteristics are displayed in Table 2 below.

Figure 1 below shows the participants' medication adherence using the Morisky Medication Adherence Scale. More than half (51.6%) of the study participants had good medication adherence.

Table 1: Sociodemographic Characteristics of the Participants

Variable	Frequency (n=384)	Percentage (%)
Age group in years		
≤40	42	10.9
41-50	89	23.2
51-60	99	25.8
61-70	97	25.3
>70	57	14.8
Mean ±SD	56.23 ±12.3	
Gender		
Male	179	46.6
Female	205	53.4
Ethnic group		
Yoruba	228	59.4
Igbo	144	37.5
Hausa	4	1.0
Others	8	2.1
Marital status		
Single	106	27.7
Married	278	72.3
Family Type		
Monogamous	311	81.0
Polygamous	73	19.0
Religion		
Christianity	307	79.9
Islam	76	19.8
Others	1	0.3
If employed type (n=247)		
Self Employed	135	54.7
Government Employed	63	25.5
Non-government employed	49	19.8
Average Monthly Income		
<50,000	90	23.4
50,000- 100,000	70	18.2
101,000- 200,000	199	51.9
>200,000	25	6.5

Table 2: Clinical/Lifestyle characteristics of participants

Variable	Frequency (n=384)	Percentage (%)
***If Type of comorbidities (n=230 with multiple responses)**		
Dyslipidemia	149	64.8
BPH	88	38.3
Diabetes	48	20.9
Glaucoma	39	17.0
Osteoarthritis	24	10.4
Others	19	8.3
BMI		
Underweight	6	1.6
Normal	126	32.8
Overweight	189	49.2
Obese	63	16.4
Smoking		
Yes	29	7.5
No	355	95.5
Alcohol consumption		
Yes	161	41.9
No	223	58.1
Fruit intake		
Yes	228	59.4
No	156	40.6
Vegetable intake		
Yes	277	72.1
No	107	27.9
Physical activity		
Yes	123	32.0
No	261	68.0

*Multiple responses
Number of participants with comorbidity=230

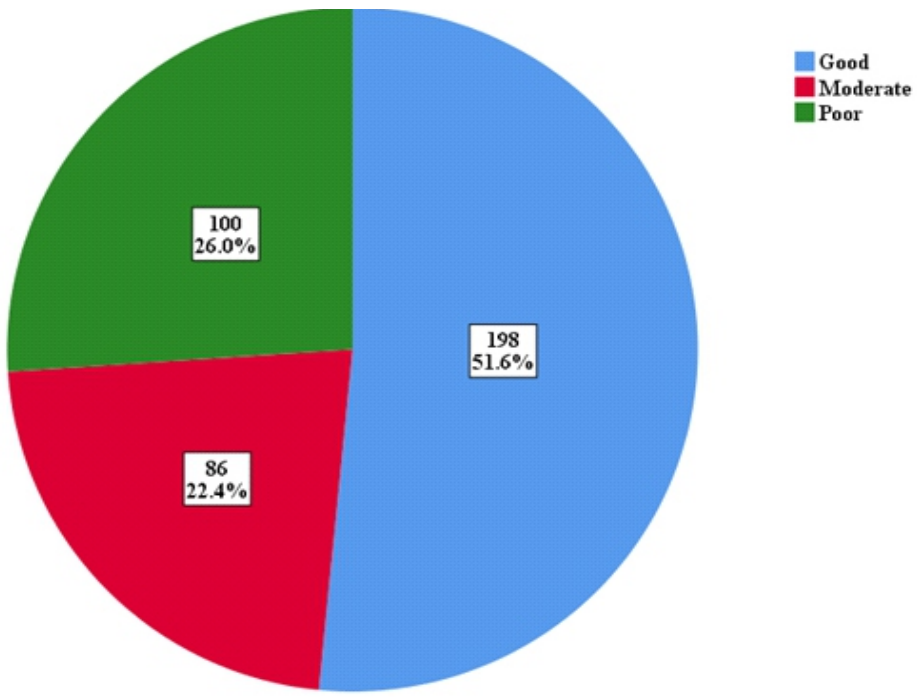

Figure 1: Medication adherence among participants

Figure 2 below displayed the blood pressure of the participants and showed that over half of them had their blood pressure controlled.

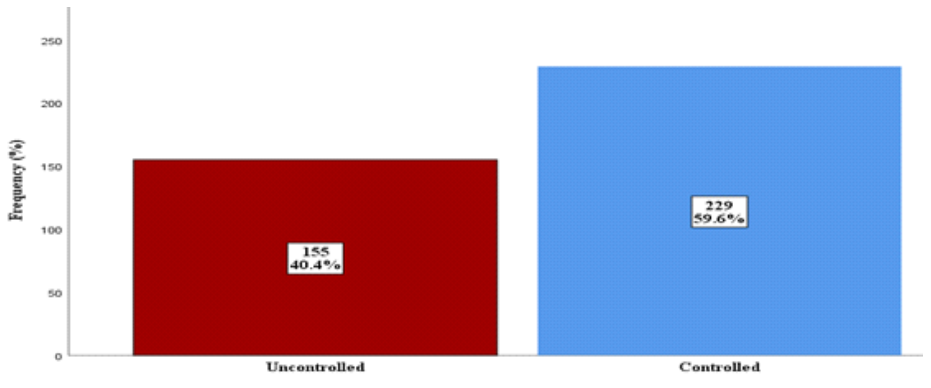

Figure 2: The proportion of hypertensive patients with blood pressure control

Table 3 below showed the bivariate analysis of blood pressure control and clinical/lifestyle characteristics. The significant factors associated with poor blood pressure control are underweight, obesity, medication non-adherence, smoking status, and duration of hypertension less than 10 years.

Table 3: Association of clinical/lifestyle characteristics and blood pressure control

Variable	Blood pressure Control (n=229)	Uncontrolled blood Control (n=155)	X^2	P- value
Presence of comorbidity				
Yes	155(67.4)	75(32.6)	14.332	<0.001*
No	74(48.1)	80 (51.9)		
BMI				
Underweight	0 (0.0)	6 (100.0)	50.735	<0.001*
Normal	78 (61.9)	48 (38.1)		
Overweight	135 (71.4)	54 (28.6)		
Obese	16 (25.4)	47 (74.6)		
Smoking				
Yes	4(14.8)	23 (85.2)	24.237	<0.001*
No	225 (63.0)	132 (37.0)		
Alcohol consumption				
Yes	85 (52.8)	76 (47.2)	5.389	<0.020*
No	144 (64.6)	79 (35.4)		
Fruit intake				
Yes	150 (62.9)	78 (37.1)	12.194	<0.002*
No	79 (50.6)	77 (49.4)		
Vegetable intake				
Yes	172 (62.4)	105 (37.6)	2.531	0.282
No	57 (53.3)	50 (46.7)		
Physical activity				
Yes	83(68.7)	40 (31.3)	11.105	0.004*
No	146 (55.9)	115 (44.1)		
Medication Adherence				
Good	170 (85.9)	28 (14.1)	151.756	<0.001*
Moderate	47(54.7)	39 (45.3)		
Poor	12 (12.0)	88 (88.0)		
Duration of Hypertension				
< 10 years	114 (49.5)	124(50.5)	43.950	<0.001*
>10 years	78(78.4)**	10(21.6)**		

*Significant, **Multiple responses

Table 4 below shows the independent predictors of uncontrolled blood pressure. The independent predictors of uncontrolled BP identified were the absence of comorbidity, BMI category of underweight and obesity, history of smoking, moderate and poor medication adherence and duration of hypertension greater than 10 years.

Table 4: Multivariate logistic regression showing independent predictor of uncontrolled blood pressure

	Odd ratio	95% CI	p-value
Presence of comorbidity			
Yes	1		
No	1.972	1.253-3.144	**0.002***
BMI class			
Normal	1		
Underweight	2.901	1.093-4.901	**0.045***
Overweight	0.668	0.398-1.126	0.130
Obese	3.842	1.854-7.961	**<0.001***
Smoking status			
Never	1		
Presently/previously smoking	7.515	1.931-29.250	**0.004***
Alcohol consumption			
No	1		
Yes	1.672	0.353-3.280	0.226
Daily fruit intake			
Yes	1		
No	1.842	0.893-2.094	0.194
Involve in physical activity			
Yes	1		
None	1.984	0.922-2.794	0.068
Medication adherence			
Good	1		
Moderate	5.038	2.812-9.026	**<0.001***
Poor	9.524	7.991-12.901	**<0.001***
Duration since diagnosis of hypertension			
<10 years	1		
>10 years	0.325	0.193-0.548	**<0.001***

CI: Confidence interval; OR=Odd ratio

DISCUSSION

Hypertension is a modifiable condition that may be prevented with lifestyle modification. Blood pressure control is the goal for all hypertensive patients to prevent complications. In achieving blood pressure control, medication adherence in combination with lifestyle modification is paramount. Body mass index is a tool that classifies the average body fat of an individual using number ranges. It is directly proportional to prehypertension, hypertension, and blood pressure control. It is therefore important to assess the influence of not just obesity but all the different categories of BMI on blood pressure control.

The socio-demographic characteristics of the participants of this study showed a high mean age, higher female gender, most are above 40 years, of tertiary education, and moderate income. This finding is in keeping with several studies.[10–13] This is in contrast to findings by Akinlua, et al., in a systematic review of the current prevalence pattern of hypertension in Nigeria who found a higher preponderance of male participants.[14] This finding of higher female gender noticed in this study may be due to better health care-seeking behavior of women compared to men. Also, Anyabolu et al in a cross-sectional study in South East Nigeria reported that the risk of hypertension declined with tertiary educational status.[15] The variation in this study could be due to the location of the study which was an urban community and most of the participants were professionals.

The systolic and diastolic blood pressure were controlled in 60% of the study participants. Similar findings have been seen in several studies. [16, 17] In contrast, a study conducted by Douglas et al at the University of Port Harcourt Teaching Hospital reported systolic and diastolic blood pressure control at 36.7%.[18] Other studies have also recorded low blood pressure control among hypertensives.[13, 19] A reason for higher blood pressure control in this study included cross-sectional study design, high medication adherence, access to drugs, Physicians' adherence to treatment guidelines including lifestyle modification counselling, and functional health care system.

This study showed that BMI is strongly associated with poor blood pressure control with underweight and obesity being the greatest culprits. Several literatures have shown association between blood pressure control and BMI. Ibrahim et al. did a hospital-based Nigerian study where 329 hypertensive patients were studied, which found that there was an association between blood control and BMI, with underweight and obesity being independent predictors of uncontrolled BP.[20] Also, Hyun-Jin et al. found out in their study that underweight amongst hypertensives is a risk factor for all-cause mortality compared to even obesity.[21] Furthermore, Abdul et al in a hospital based cross- sectional study among one hundred and twenty three hypertensive patients in Northern Nigeria, assessed blood pressure control factors and found out that blood pressure control was associated with BMI, with obesity being an independent risk for uncontrolled BP.[22] In addition, Oseni *et al*. in a descriptive cross-sectional study conducted in the general and medical outpatient clinics of Irrua Specialist Teaching Hospital, Edo State, found that there was an association between blood pressure control and waist circumference with obesity being an independent risk for uncontrolled BP.[23] To further buttress, Jesky *et al.* carried out a prospective study among hypertensive patients attending a teaching hypertension hospital clinic in Birmingham, United Kingdom, for an 11-year period. They reported that there was a strong association between blood pressure control and elevated BMI, with obese patients needing more anti-hypertensive medication to control their BP than the obese non-obese even after controlling for cofounders.[24] Physicians should reinforce non -non-pharmacological strategies of BP control in the clinics among hypertensives. They should assess the BMI of patients and counsel on measures to obtain normal weight, discouraging both underweight.

LIMITATION

This cross-sectional hospital-based study was subject to some limitations. The significant associations between the variables tested in this study were not necessarily causal. Only a prospective or randomized controlled study can confirm the causal relationship between these variables.

CONCLUSION

The present study is pertinent as it can guide health professionals in taking a holistic approach to managing hypertension and achieving better blood pressure control for their patients, thereby reducing all-cause mortality.

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