Original Research Article

Relationship between Body Mass Index and Blood Pressure Level in Hypertensive Patients Attending Kiambu District Hospital, Kenya

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ABSTRACT

Uncontrolled hypertension is the primary cause of cardiovascular disease occurrence which greatly contributes to fatality worldwide. Obesity is known to impact cardiovascular health, being an appropriate predictor of blood pressure. Many hypertensive patients have been found to be obese across the world. Scarce information exists on the relationship between obesity and blood pressure level among hypertensive patients. This research aimed at assessing the body mass index of hypertensive patients in a developing country. The study was conducted on a sample of 134 hypertensive patients attending Kiambu District Hospital in Kenya. Cross-sectional analytical research design was adopted and respondents selected using systematic sampling method. Anthropometric parameters of weight and height were used to assess body mass index. A pretested questionnaire was used to collect data from the respondents. Data was analyzed by use of statistical package for social science. The respondent's body mass index was described by use of descriptive statistics. The relationship between blood pressure level and body mass index was determined by use of Pearson correlation test. A p-value of <0.05 was used as criterion for statistical significance. The study population had high body mass index as revealed by the high prevalence of overweight and obesity at 82.9%. Of the 134 respondents, 79.1% had uncontrolled blood pressure. Positive significant relationship was found between body mass index and blood pressure (*r*=0.683, p<0.001). Based on these findings, measures that would lead to healthy body mass index among hypertensive patients should be put in place for better hypertension management.

Key Words: Body mass index, hypertension, overweight, obesity

INTRODUCTION

Hypertension accounts for 10% of health care spending globally. [1] It is a modifiable risk factor for renal disease and cardiovascular disease. Hypertension is defined as a systolic blood greater than 140 mm Hg and a diastolic blood pressure greater than 90 mm Hg based on the average of two or more correct blood pressure measurement taken by a health care provider. Among hypertensive patients worldwide, only 31% have optimal blood pressure levels. [2] The Kenya Stepwise Survey Report [3] indicated that the prevalence of uncontrolled hypertension among hypertensive patients in Kenya is at 24%. Many hypertensive patients regularly attend hospital due to health complications caused by the disease. In Kiambu County, a rise in hypertension prevalence has been observed. The disease is ranked seventh and fifth in causing fatality and hospital admission respectively in the County. [4]

Uncontrolled hypertension damages cells lining coronary vessels resulting in inflammation, vascular weakness and scarring, blood clots, blocked arteries and plaque formation. [5-8] Prolonged periods of uncontrolled hypertension affect heart functions by weakening heart muscles and enlarging the heart which may lead to death. Glomerulosclerosis is caused by uncontrolled hypertension when blood vessels are damaged by high blood pressure. [9] The most appropriate predictor of blood pressure level has been reported to be nutrition status hence important for maintenance of optimal blood pressure levels. Obesity is known to impact cardiovascular health globally and is related to uncontrolled hypertension. Obesity is associated with 16% stroke related deaths. [10] Studies have indicated that the risk of developing hypertension independent of physical inactivity and unhealthy diets is increased 3 times in overweight people. [11-12] An estimated 27% people in Kenya are overweight or obese. [13] Obesity affects the rennin-angiotensin aldosterone system increasing absorption of renal sodium which results in elevated blood pressure. Obesity is also known to cause insulin resistance leading to sodium retention. Obesity increases the risk of heart failure since excess weight raises cardiac output lowering peripheral resistance. Weight reduction through increased physical activity and dietary changes help in maintenance of optimal blood pressure. [14] It is important to sensitize hypertensive patients on the benefits of behaviour change and put in place measures that encourage adoption of healthy practices.

Several anthropometric measures have been identified as measures of obesity with BMI being found the most appropriate due to its accuracy and reproducibility. [15] This study therefore used this parameter to determine nutrition status. Achieving and maintenance of optimal blood pressure levels in hypertensive patients is beneficial for the prevention of hypertension complications. There is paucity of published research findings on the relationship between blood pressure and BMI of hypertensive outpatients in Kenya hence the need for this study.

Increased hypertension prevalence in health populations has been observed with increased age. [16] Advanced age impairs the function of the heart by altering the vascular structure leading to arterial stiffness that decreases buffering hence increasing blood pressure. Studies have reported that the age group with the highest risk of uncontrolled blood pressure among hypertensive patients is 18-57 years. [16-17]

METHODS

A Cross-sectional analytical research design was adopted in this study. The study was carried out at Kiambu District Hospital in Kiambu County, Kenya. The target population was hypertensive out-patients aged between 18-57 years attending the outpatient clinic at Kiambu District Hospital. The identified patients were on regular medical check-ups and follow up at the hospital based on their blood pressure levels. Hypertensive patients attending the hypertensive clinic for the first time, expectant women and those with health complications including diabetes, kidney and heart diseases were excluded from the study. Participants were identified by use of systematic sampling technique. Data collection was carried out for three months to obtain the sample size of 134.

RESEARCH INSTRUMENTS

Anthropometry data was collected by use of anthropometric parameters of height and weight followed by calculation of BMI. The respondents stood straight with minimum clothing with no shoes for the height to be taken using a stadiometer and a wooden head board. The height was measured to the nearest 0.5 centimetres. A weighing machine calibrated to zero was used to measure weight recorded to the nearest 0.05 kilogram. The measurements were taken thrice and the average calculated. BMI was determined by dividing

weight in (kg) by height squared (m^2) BMI was then categorized according to WHO body mass index cut off points of underweight (BMI<18.5), normal weight (BMI; 18.5–24.9), overweight (25–29.9) and obesity (BMI>30).

Mercury sphygmomanometers were used to take blood pressure measurements. The respondents were allowed five minutes relaxation before the test was conducted. The client was seated with legs uncrossed back and arm supported. The reading was done at the cuff where all clothing around the area was loose. Three readings were taken with a repeat being done at 3-5 minutes interval and an average calculated and blood pressure levels then categorized using WHO cut off points.

DATA ANALYSIS AND PRESENTATION

Before data entry the filled questionnaires were coded, checked and cleaned for consistency. The data was then entered into the computer for analysis. Statistical package for the social science was used to analyse data from blood pressure level and anthropometry. BMI levels of the study population were described by use of descriptive statistics. Pearson correlation coefficient test established the relationship between blood pressure level and BMIA p-value of <0.05 was used as a criterion for statistical significance.

Ethical Clearance

Approval was sought from Kenyatta University Graduate School. Ethical clearance was obtained from Kenyatta University Ethical Review Committee. A research permit was obtained from the National Commission for Science, Technology and Innovation (NACOSTI). Permission was also sought from Kiambu Hospital management to access the medical records of the patients. Respondents participated in the research based upon their informed consent and assurance of confidentiality by the researcher.

RESULTS

Hypertensive characteristics

Majorities (69.4%) of the respondents were women and only 30.6% were men. The age group with the largest number of respondents (38.8%) was 50-57 years old. Overall 76.1% of the respondents had been diagnosed with hypertension in less than 5 years with majority (64.2%) visiting the hypertensive clinic for the second time. Approximately 79.1% of respondents had a SBP equal to or greater than 140 mmHg while 72.4% had a DBP equal to or greater than 90 mmHg. The mean Systolic blood pressure was 146.23±0.87 and the diastolic blood pressure 92.06 ± 0.12.

Table 1: Respondents Demographic characteristics, health seeking behaviour and blood pressure levels

Hypertensive Characteristics						
	Male		Female		Total	
Variable	n	%	n	%	n	%
Age in Years						
18-25	6	14.6	14	15.1	20	14.9
26-33	5	12.2	9	9.7	14	10.4
34-41	5	12.2	20	21.5	25	18.7
42-49	10	24.4	13	14.0	23	17.2
50-57	15	36.6	37	39.8	52	38.8
Length of illness						
< 5 years	25	61.0	77	82.8	102	76.1
5-10 years	14	34.1	9	9.7	23	17.2
>10 years	2	4.9	7	7.5	9	6.7
No. of Clinic Visits						
2 times	27	65.9	59	63.4	86	64.2
3-4 times	8	19.5	19	20.4	27	20.1
>5 times	6	14.6	15	16.1	21	15.7
Systolic Blood pressure						
< 140 mmHg	16	39.0	12	12.9	28	20.9
>=140 mmHg	25	61.0	81	87.1	106	79.1
Diastolic Blood pressure						
< 90 mmHg	15	36.6	22	23.7	37	27.6
>=90 mmHg	26	63.4	71	76.3	97	72.4

Nutrition Status of the Respondents

Nutrition status of the study subjects was determined by use of WHO (2004) BMI cut off points. The average BMI of the study respondents was 27.63±1.12. The study findings indicated that majority (59.0%) of the respondents were overweight, while 23.9% were obese.

When cross tabulation was done to compare BMI and age, the results showed that majority (33) of the overweight respondents were in the 50-57 years age group.

Table 2: Cross tabulation BMI & Age

BMI	Age in Years					
	18-25	26-33	34-41	42-49	50-57	Total
Underweight	2	0	1	0	9	12
Normal	6	0	2	1	2	11
Overweight	8	11	12	15	33	79
Obese	4	3	6	5	14	32

Relationship between BMI and blood pressure

A positive significant relationship (r=0.772, p=0.028) was observed between BMI and SBP, this meant that SBP increased with increased BMI.

Table 3: Relationship between BMI and blood pressure

Variable	r	p-value
BMI and systolic blood pressure	0.772*	0.028
BMI and diastolic blood pressure	0.444	0.849

*Correlation is significant at the 0.05 level (2-tailed).

DISCUSSION

Age is both a risk factor for onset of hypertension and uncontrolled hypertension. In this study majority of the respondents were in the age group of 50-57 years this finding is in agreement with other studies that have reported blood pressure level increases with age. [18-20] In the current study age was found to influence BMI establishing a trend of increased weight with age, findings that are in agreement with other studies that have linked weight gain to age. [21-23] Approximately 79.1% of respondents had a SBP equal to greater than 140 mmHg while 72.4% had a DBP equal to or greater than 90 mmHg. These findings show that majority of the respondents in the current study had sub optimal blood pressure level.

In this study, 82.9% of the respondents were both overweight and obese. Similar findings of a majority of hypertensive patients being overweight and obese have been reported in other studies. [24-26] This finding could be explained by the possible fact that the respondents were consuming unhealthy diets and had low levels of physical activity. The current study findings showed a significant relationship between blood pressure and BMI. The relationship between hypertension and obesity has been documented globally with [27-28] reporting significant relationship between obesity and hypertension.

CONCLUSION

High prevalence of overweight and obesity, and uncontrolled hypertension was observed in the current study. This indicates the urgent need for hypertensive patient's behavior overhaul to increased physical activity engagement and healthy dietary intake for achievement and maintenance of healthy body weight. In this regard, health professionals should consider early nutrition screening of hypertensive patients to prevent overweight and obesity. Intervention programs that create awareness on the importance of health lifestyle for optimal blood pressure levels should be developed by relevant policy makers.

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