

TREATMENT RESPONSE IN ADULT PATIENTS WITH HYPERTENSION ATTENDING A SECONDARY HEALTH CARE CENTER IN SOUTH-WEST NIGERIA

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ABSTRACT

Background: There has been an increase in prevalence of hypertension worldwide and a trend towards poor control of hypertension. Despite the development of new guidelines on management of hypertension, it remains a difficult disease to control.

Methods: The study was a prospective cohort study of 386 patients aged 18 to 70 years with uncontrolled hypertension. A simple random sampling technique with computer generated random numbers was used for selection.

Results: Majority (58.3%) of the respondents who were overweight had diastolic blood pressure of less than 100 mmHg while 55 (41.7%) respondents who were overweight had diastolic blood pressure of 100mmHg to 110mmHg. Forty (42.1%) of the respondents who were obese had diastolic blood pressure of less than 100mmHg while 55 (57.9%) respondents who were obese had diastolic blood pressure of 100mmHg to 110mmHg. The association was statistically significant ($\chi^2 = 9.845$, p-value = 0.02). There was a significant difference between the mean first Systolic Blood pressure and the mean third systolic blood pressure. (< 0.001, 95% CI 19.01- 23.04). Also there was a significant difference between the mean first Diastolic Blood pressure and the mean third Diastolic Blood pressure. (p < 0.001, 95% CI 11.13-11.56).

Conclusion: This study has shown that increasing body weight was associated with high blood pressures and health education on management of hypertension had significant effect in reducing blood pressures and subsequently leading to better control of hypertension.

Keywords: Treatment response, Hypertension, Secondary healthcare center, Nigeria

INTRODUCTION

There has been an increase in prevalence of hypertension worldwide and a trend towards poor control of hypertension. Hypertension is defined as a persistent systolic blood pressure (BP) reading of 140 mmHg or greater and or a diastolic blood pressure reading of 90mmHg or greater.^{1,2} In Nigeria, it is the main risk factor for stroke, heart failure, ischemic heart disease and kidney failure.³ Higher prevalence of hypertension and its complications have been found in people of African descent.

The prevalence of hypertension has been found to be 44% in Western Europe and 28% in North America.⁴ However, Azubuike and Kurmi reported 24.2% in their study conducted in Sanga, Kaduna Northern Nigeria.⁵ Despite the development of new drugs and guidelines in management of hypertension, it remains

a difficult disease to control. In the United States of America, blood pressure control was achieved in 48.4% of hypertensive patients on pharmacotherapy.^{6,7} Literature review has shown that in about a third of hypertensive patients blood pressure has been controlled by monotherapy, in about another third, blood pressure was controlled by bi-therapy and the remaining third by three or more drugs. A difficult to treat hypertension is defined as blood pressure of $\geq 140/90$ mm Hg, or $\geq 130/80$ mmHg in diabetics and patients with chronic kidney disease despite use of at least three antihypertensive drugs prescribed at optimal doses.^{8,9} Controlled blood pressure is a blood pressure of less than 140/90mmHg in hypertensives and less than 130/80 in hypertensive diabetics and patients with chronic renal failure. Failure of adherence to prescribed drugs is a major cause of poor blood pressure control,

particularly in chronic diseases like hypertension.^{10,11} With good adherence to medication and strict lifestyle changes, the control of hypertension is a possibility and can be achieved.¹²

Most patients with hypertension will require two or more anti-hypertensive drugs to achieve targeted blood pressure levels. The recommendation of the current International guidelines for optimization of drug treatment includes the need for prompt initiation of drug treatment, selection of the most appropriate antihypertensive agents and the use of monotherapy or combination therapy based on the level of blood pressure. Also included is the presence of other cardiovascular risk factors, target organ damage, or concomitant conditions.² Combination therapy was found to be more efficacious than monotherapy in most patients with hypertension.⁷

Factors associated with blood pressure control were found to be type of health insurance, nonsmoker status, and increased number of medications used.¹³ It is a common finding that hypertensive patients in the community fail to meet treatment goals according to the reports of a study conducted by Fahey *et al.* It is projected that only 25 to 40 percent of treated hypertensives achieve blood pressure goals.¹⁴

Multivariate analysis on discharge of patients showed that the predictors of good blood pressure control were diuretics and beta-blockers and the predictors of poor blood pressure control were diabetes, chronic kidney disease, diabetic nephropathy and cerebrovascular disease. Patients with diabetes, renal disease and cerebrovascular disease were more likely to have poor control of their blood pressure.¹⁵

The eventual public health goal of treatment for hypertension is to reduce cardiovascular and renal morbidity and mortality. To prevent complications, it is important to develop patient-centered interventions that will educate patients on the importance of achieving good blood pressure control.^{15, 16}

In the majority of patients, to reduce systolic blood pressure has been considerably more difficult than reducing diastolic blood pressure. Lifestyle modifications, efficacious and adequate antihypertensive medication doses, or appropriate drug combinations must be prescribed to have adequate blood pressure control.²

Non-pharmacological therapy is an essential part of treatment of all patients with hypertension. This include decreasing dietary sodium to less than 2.4g per day; increasing exercise to at least 30 minutes per day, four

days per week; restricting alcohol consumption to two drinks per day for men and one drink per day for women; following the dietary approaches to stop hypertension eating plan (high in fruits, vegetables, potassium, calcium and magnesium; low in fat and salt); and attaining a weight loss goal of 4.5kg or more.¹⁷ Pharmacological management include use of diuretics, angiotensin converting enzyme inhibitors, angiotensin receptor blockers, calcium channel blockers, beta-blockers, alpha adrenergic blockers, vasodilators and centrally acting drugs.¹⁸ This study aims to determine the effect of health education on blood pressure reduction and assess the response to treatment over time in adult hypertensive patients presenting to the State Hospital, Oyo.

METHODOLOGY

The study was conducted at the State Hospital Oyo (SHO). Oyo is a sub-Urban community located in Oyo central senatorial zone of Oyo State in the South-Western Zone of Nigeria in which the Yorubas are the predominant ethnic group. The study was a prospective cohort of 386 patients with uncontrolled hypertension. Respondents were recruited from April 2015 to May 2015 and followed up till July 2015. A simple random sampling technique with computer generated random numbers was used for selection. The study population was composed of adults 18 years to 70 years with an established diagnosis of hypertension and already on treatment and follow up for a year.

Inclusion criteria included patients who are 18-70 years with uncontrolled blood pressure and office blood pressure of $\geq 140/90$ mmHg. Exclusion criteria included patients with systolic blood pressure ≥ 180 mmHg and diastolic blood pressure ≥ 110 mm Hg who would need immediate adjustment of treatment, patients with renal insufficiency, pregnant and lactating women and patients with diabetes mellitus.

Data collection and analysis: A structured questionnaire was administered to consenting subjects. A pretest of the questionnaires was carried out at the General hospital, Ilora, seven kilometers away from the study site on 40 patients to identify potential problems and amendments were done where necessary. Incomplete filling of questionnaires observed during the pretest leading to missing values were corrected during the main study.

Measurement of blood pressure: A standard mercury sphygmomanometer (Accosson, London) provided with an armband for adult of 12 cm large was used, and systolic blood pressure and diastolic blood pressure were taken as Korotkoff sounds phases I and V respectively. The display of the sphygmomano-

meter was positioned away from the patient to ensure blinding to the blood pressure readings. The measurements were taken with the patient in a seated position with their arms supported at heart level, after five minutes of rest, abstinence from food, nutritional supplements, caffeinated beverages and smoking for a minimum of two hours before the appointment at approximately the same time and day of the week.

A cuff of appropriate size was applied to the exposed upper arms and was rapidly inflated to 30mmHg above the level at which the pulse disappeared and then deflated gradually. Blood pressure was measured as two serial measurements at intervals of two minutes using auscultatory methods. The mean of the two blood pressures recorded was used in the analysis. Drug dosage was increased whenever there was failure of control as treatment continued. Three consecutive clinic blood pressure values at an interval of four weeks were recorded for each hypertensive patient, and averages of two measurements were calculated for systolic blood pressures and diastolic blood pressures separately. Blood pressures were measured at first contact (BP1), at four weeks (BP2) and at eight weeks (BP3) respectively. Blood pressure was considered to be well controlled if it was less than 140/90 mm Hg and uncontrolled if higher than 140/90 mm Hg.

Body Mass Index: The weights of the participants were taken using a portable weighting scale (Hana, China). Heights of the participants were measured using a Stadiometer. It has a firm horizontal surface and a vertical surface with calibrations in meter scale to 1.95 meters. The patient stands on the horizontal surface with his heel, back and occiput making contact with the vertical surface. The highest point of the head was projected to the scale with a ruler and read as the patients' height in meters. Body Mass Index (BMI) was calculated by dividing the weight in kilograms by the square of the height in meters. BMI was categorized as underweight if $<18.5 \text{ kg/m}^2$, normal from 18.5–24.9 kg/m^2 , overweight from 25–29.9 kg/m^2 and obese if $\geq 30 \text{ kg/m}^2$.¹⁹ The weight was recorded in kilograms to the nearest 0.1 kg using a weighing scale, and the height was recorded in meters to the nearest 0.05 m. The body mass index (BMI) was calculated as the weight in kilograms divided by the square of the height in meters by using the SPSS.

The intervention: During the administration of questionnaires to the respondents at first contact, patients received essential information about the nature of hypertension, its complications if not controlled, medications and adherence to pharmacotherapy. They were told about self-care and lifestyle modifications that included types of diet, recommended physical

exercise and the need to adhere to their medications for better control of blood pressure. They were advised to develop good attitude and practice toward hypertension. Achieving blood pressure targets of less than 140/90mmHg as well as adherence to medications were emphasized to patients. The recommended target blood pressure was $<140/90 \text{ mm Hg}$ for all patients recruited. The health education was repeated before blood pressure measurements during the follow up periods.

Data was analyzed using SPSS (Statistical Package for Social Sciences) software version 15. Frequency tables and charts were used for relevant variables. Paired Student T-test was used to compare the means of two groups of blood pressures. The blood pressure reductions induced by antihypertensive regimens was analyzed by Paired Student T-test. A p-value of ≤ 0.05 was considered to indicate statistical significance.

The study was approved by the Ethical Review Committee of Oyo State Ministry of Health, State Secretariat, Ibadan. Informed consent was obtained from eligible patients before administration of the questionnaires and examinations. Privacy and confidentiality of the respondents were guaranteed by anonymity of respondents.

RESULTS

Socio-demographic characteristics of respondents was shown in Table 1.

Three hundred and eighty-six patients who met the criteria for recruitment were interviewed. The mean age of the respondents was 57.00 (± 10.7) years. Six patients were less than 35 years. Almost one third of the patients were between 45-54 years of age and about half of the respondents were from 55 years and above. Male to female ratio was 0.2:1. There were 126(32.8%) Christians, 256(66.7%) Muslims and only two (0.5%) Traditional worshippers.

Majority of the respondents (97.8%) were from the Yoruba ethnic group and also majority (66.5%) of the respondents were married. Six of the respondents were single. More than half (57.2%) belong to the monogamous while less than half (42.6%) belong to polygamous family system of marriage. About three quarters (78.0%) of the respondents were self-employed while others were civil servants, pensioners, housewives and students.

Anti-hypertensive drugs used by the patients

One hundred and forty-seven (39.7%) respondents were on moduretic, 143 (38.8%) of the patients were on amlodipine, 116 (31.4%) respondents were on

Table 1: Socio-demographic characteristics of respondents

Variable	Frequency (n)	Percentage (%)
Age group (years)		
< 35	6	1.6
35-44	32	8.3
45-54	132	34.1
55 and above	216	56.0
Sex		
Male	64	16.6
Female	322	83.4
Family setting		
Monogamous	219	57.2
Polygamous	163	42.8
Highest education level		
No formal education	187	48.6
Primary	87	22.6
Secondary	59	15.3
Tertiary	52	13.5
Occupation		
Civil servant	54	14
Self employed	301	78.0
Retiree	21	5.4
Student/housewife	10	2.6

nifedipine, 67 (18.1%) patients were on enalapril, 86 (23.3%) of the respondents on lisinopril, 33 (8.9%) respondents were using ramipril, 33 (8.9%) were using methyldopa, 21 (5.7%) of the respondents were on losartan, five (1.4%) of the respondents were on atenolol, one (0.3%) respondents was on propranolol, two (0.5%) patients were on hydralazine

Distribution of grouped Body Mass Index of respondents

Eleven (3.0%) respondents were underweight while 129 (35.1%) respondents had normal weight. Also 132 (36.0%) respondents were overweight while 95 (25.9%) were obese.

Association of Body Mass Index with Blood Pressure Levels

Table 2 shows association of Body Mass Index with blood pressure levels.

Sixty-four (48.5%) respondents who were overweight had systolic blood pressure less than 160 while a slightly higher proportion of respondents, 68 (51.5%) had systolic blood pressure of 160mmHg to 180mmHg. Thirty-six (37.9%) respondents who were obese had systolic blood pressure less than 160 while a majority (62.1%) of the respondents who were obese had systolic blood pressure of 160 mmHg to 180mmHg.

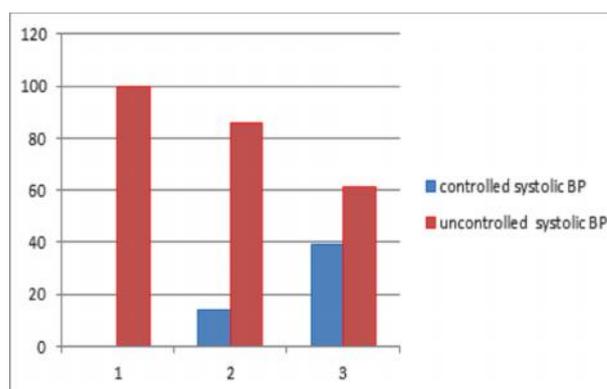


Fig. 1: Systolic blood pressure changes at 4 weeks interval

Table 2: Association of Body Mass Index with grouped first Systolic Blood pressures

Variable	< 160(mmHg)	160-180(mmHg)	χ^2	p-value
Grouped BMI				
Underweight	7(63.6%)	4(36.4%)	4.328	0.228
Normal weight	55(42.6%)	74(57.4%)		
Overweight	64(48.5%)	68(51.5%)		
Obese	36(37.9%)	59(62.1%)		
Association of Body Mass Index with grouped first Diastolic Blood pressures				
Variable	< 100(mmHg)	100-110(mmHg)	χ^2	p-value
Underweight	7(63.6%)	4(36.4%)	9.845	0.02*
Normal weight	80(62.0%)	49(38.0%)		
Overweight	77(58.3%)	55(41.7%)		
Obese	40(42.1%)	55(57.9%)		

The association was not statistically significant. ($\chi^2 = 4.328$, p -value = 0.228).

Majority (58.3%) of the respondents who were overweight had diastolic blood pressure of less than 100mmHg while 55 (41.7%) respondents who were overweight had diastolic blood pressure of 100 mmHg to 110mmHg. Forty (42.1%) of the respondents who were obese had diastolic blood pressure of less than 100mmHg while 55 (57.9%) respondents who were obese had diastolic blood pressure of 100 mmHg to 110mmHg. However, the

Blood Pressure of Respondents After two Months of Follow Up

Figure 1 showed that out of the three hundred and eighty-six respondents that were recruited, 39.4% had their systolic blood pressure controlled and 60.6% of the patients had their systolic blood pressure uncontrolled.

Figure 2 showed that out of three hundred and eighty-six respondents that were recruited, 65.6% had their diastolic blood pressure controlled and 131(34.4%) patients had their diastolic blood pressure uncontrolled.

Table 3: Effect of health education on patients with uncontrolled blood pressures (paired T-Test)

Variable	Mean	Standard deviation	Df	p-value	95% CI
First SBP to third SBP	21.02	19.88	375	< 0.001*	19.01-23.04
First DBP to third DBP	12.35	11.97	375	< 0.001*	11.13-11.56

*Significant at 5% level of significance

association was statistically significant ($\chi^2 = 9.845$, p -value = 0.02)

Effect of Health Education on Patients with Uncontrolled Blood Pressures (paired T-Test)

Table 3 shows effect of Health education on patients with uncontrolled blood pressures.

There was a significant difference between the mean first Systolic Blood pressure and the mean third systolic blood pressure. ($p < 0.001$, 95% CI 19.01-23.04).

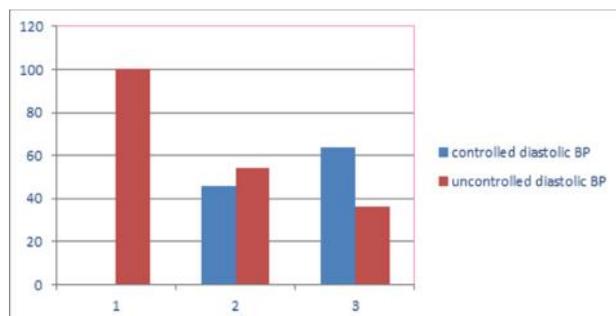


Fig. 2: Diastolic blood pressure changes at 4 weeks interval

There was a significant difference between the mean first Diastolic Blood pressure and the mean third Diastolic Blood pressure. ($p < 0.001$, 95% CI 11.13-11.56)

DISCUSSION

Despite the development of new guidelines on management of hypertension and the availability of new drugs, the proportion of patients with uncontrolled blood pressure is still very high. In this study female respondents constituted a little above four fifths of the respondents while male respondents constituted about one fifth of the population recruited. This could be due to the fact that females seek health care more than males. Majority of the respondents were above 55 years which showed that hypertension is commoner in the older age groups. The results of this study about severity of hypertension showed that majority of the respondents had systolic blood pressure of between 160mmHg and 180mmHg while a minority of the respondents had systolic blood pressure of less than 160mmHg. The higher the level of blood pressure the higher the risk of developing complications associated with high blood pressure. So this population of respondents has been exposed to the risk of developing chronic kidney disease, stroke and hypertensive heart failure.

The results of this study showed that there was a significant reduction in the blood pressure of the respondents from the first contact when the questionnaire was administered and health education about management of hypertension was given and two months later when the third blood pressures were measured. The results of this work showed that about two-thirds of the patients had their diastolic blood pressure controlled whereas about two-fifths had their

systolic blood pressure controlled. This was corroborated by Protogerou *et al.* who reported that anti-hypertensive drug therapy achieves better control of diastolic blood pressure (DBP) than systolic blood pressure.²⁰

Treatment of hypertension with medications would depend on the patients' level of blood pressure, comorbidities like diabetes and end organ involvements. So the treatment has to be individualized depending on the patients. The commonest drug used by respondents in this study was moduretic and the least prescribed was the vasodilator hydralazine. This was similar to what was reported in a Teaching hospital study in Kano by Tamuno and Babashani that diuretics were the commonest drugs used by the patients and hydralazine was the least prescribed.²¹ Busari *et al.* also reported that diuretics were the commonest drugs prescribed in a rural tertiary hospital in Nigeria.²²

Sulaiman *et al.* however found that alpha-methyldopa and moduretic were the commonest drugs prescribed in a semi-urban community where they conducted their study.²³ Besides, in a study conducted in Igbo-Ora, Oyo State, it was reported that diuretics and alpha-methyldopa were the commonest medications used by the respondents.²⁴ However, a study conducted at the University College Hospital, Ibadan showed that the commonest drugs used were angiotensin converting enzyme inhibitors and calcium channel blockers which was similar to the findings of this study except that moduretic had the highest number patients on it.²⁵ This was corroborated by other studies conducted by Kaur *et al.* and Potchoo *et al.* which revealed that angiotensin converting enzyme inhibitors and calcium channel blockers were the most commonly prescribed antihypertensive drugs.^{26,27}

Obesity was found to be a risk factor for uncontrolled hypertension according to a report by Calhoun *et al.*⁸ This study has shown that the blood pressure levels increase with body mass index which is a measure of the weight of the respondents. Those who were obese among the respondents tend to have higher blood pressure levels compared with those respondents with normal body weights. There was a significant association between Body Mass Index and diastolic blood pressure levels, the higher the body mass index the higher the blood pressure. The higher the severity of obesity the higher the blood pressure. The report of a study conducted in Tanzania showed that obesity and high cost of medications were associated with poor blood pressure control.²⁸ Patients should be educated about the recommended diet for hypertension and recommended form of exercise for better control of blood pressure. The results of this

study showed that there was a significant reduction in the blood pressures of the respondents from the first contact when the questionnaires were administered and health education about management of hypertension was given and two months later when the third blood pressures were measured. The results of this work showed that diastolic blood pressures were better controlled than systolic blood pressures. This was corroborated by Protogerou *et al.* who reported that anti-hypertensive drug therapy achieves better control of diastolic blood pressure than systolic blood pressure.²⁰

In conclusion, this study has demonstrated that increasing body weight is a risk factor for developing high blood pressures and health education of patients on management of hypertension has significant impact in reducing blood pressures and subsequently leading to better control of hypertension. So, health care providers should endeavor to educate patients with hypertension on non-pharmacological and pharmacological management of hypertension to improve their blood pressure control.

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