ORIGINAL ARTICLE

LEVEL OF BLOOD PRESSURE CONTROL AMONG HYPERTENSIVE PATIENTS RECEIVING TREATMENT AT FEDERAL MEDICAL CENTRE NGURU YOBE STATE NORTH EASTERN NIGERIA

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ABSTRACT

Background: Hypertension remains the most readily identifiable and reversible risk factor for cardiovascular diseases (CVD) and is the leading cause of death worldwide. Despite the avalanche of medications for the management of elevated blood pressure, adequate control of systemic hypertension has largely remained enigmatic. Previous studies from African countries including Nigeria have shown that blood pressure (BP) control still remained poor. The objective of this study therefore was to determine the level of blood pressure control among hypertensive patients on treatment and identify associated factors **Methodology:** The study was an observational, cross-sectional study of consecutive hypertensive patients attending the general outpatient, cardiac, endocrine and renal clinics at the Federal Medical Centre Nguru, in northeastern Nigeria; conducted over a period of six months from June 2016 to December 2016. **Result:** A total of two hundred and ninety one (291) consecutive subjects, comprising 134(46.1%) males and 157(53.9%) females were recruited. The mean age of the study population was 56.15±12.72.There was no difference in the mean age of subjects with controlled and uncontrolled hypertension 57.13±12.97 and 55.48±12.54 respectively with P = 0.275. One hundred and nineteen (40.9%) subjects had controlled hypertension while the remaining 172(59.1%) had uncontrolled hypertension. There was a significant difference in the mean systolic and diastolic blood pressure of subjects with controlled and uncontrolled hypertension (116.22± 12.14 and 153.14±18.17)P = 0.001 and (73.78±8.02 and 89.53±11.12) P = 0.001 respectively. The predominant pattern of uncontrolled hypertension among the study population was combined systolic and diastolic hypertension. **Conclusion:** Our study revealed that blood pressure control among hypertensive on medication was not optimal, decreased glomerular filtration rate, low anti-hypertensive medication adherence and use of NSAID were found to be responsible for the inadequate blood pressure control observed in this study. Poverty and ignorance were major contributing factors for low medication adherence.

Keywords: Blood pressure, Treatment, Control, Nguru.

INTRODUCTION

Hypertension remains the most readily identifiable and reversible risk factor for cardiovascular diseases (CVD). [1] Because of the escalating burden of obesity and population aging in developed and developing countries, the global burden of hypertension is rising, projected to affect an estimated 1.5 billion persons, a third of the world population by the year 2025.[1] Hypertension remains the leading cause of death worldwide, and one of the world`s great public health challenge.[2] World Health Organization reported that suboptimal blood pressure control is responsible for 62% of cerebrovascular disease and 49% of ischemic heart disease.[3] Despite the avalanche of medications for the management of elevated blood pressure, adequate control of systemic hypertension has largely remained enigmatic. National Health And Nutrition Examination Survey (NHANES) study showed that only about 52.5% of treated individuals were found to have controlled BP.[4] In a survey conducted in US 2003-2004, only about 37% of hypertensive patients were reported to have their blood pressure controlled[5].Blood pressure control among hypertensive in UK was reported to be approximately 9.3%.[5,6] A systematic review of 24 observational studies including 47,964 patients with both DM and hypertension reported that only 12% of participants had controlled blood pressure (BP),[7]Previous studies from African countries including Nigeria revealed a poor blood pressure control among hypertensive subjects, 1.7% in rural Ghana,[8] 4% in urban slum dwellers in Nigeria,[9] and 21.5% in urban Kenya.[10] About half of the hypertensive patients on follow up in Southwest Ethiopia had uncontrolled hypertension as previously reported by Solomon et`al.[11] Similar poor blood pressure control was reported by Igbiks and Babashani in Kano northern Nigeria 34.5%,[12] Ilohet`al in Umuahia South eastern Nigeria 35%,[13] Salako et`al in Ibadan South western Nigeria 36%.[14] The objective of this study therefore was to determine the level of blood pressure control among hypertensive patients on treatment and identify associated factors.

MATERIALS AND METHOD

The study was an observational cross-sectional study of consecutive hypertensive patients attending the general outpatient, cardiac, endocrine and renal clinics at the Federal Medical Centre Nguru, in northeastern Nigeria, conducted over a period of six months from June to December 2016. Ethical clearance was obtained from the ethics and research Committee of the Federal Medical Centre Nguru Yobe State, Nigeria. (Appendix 1) All participating subjects signed informed consent form after being clearly explained to them (Appendix II).

A validated physician-administered questionnaire was used in obtaining relevant data i.e. information on demographic data, duration of hypertension, duration of diabetes mellitus, use of analgesic medication, lipid lowering drugs, oral contraceptive pills, cigarette smoking, alcohol consumption and level of physical activity were obtained. The level of adherence to medications was assessed using the Morisky Medication Adherence Scale-4, which categorized the level of medication adherence into high, if the MMAS score is 0, medium if the MMAS score is 1 - 2 and low if the MMAS is 3 – 4.[15] Blood pressure was measured using a mercury sphygmomanometer (Acuson) adhering to standard procedure.[16] Hypertension was considered controlled if blood pressure was less than 140/90 mmHg and uncontrolled if it is equal to or greater than 140/90mmHg.[17] Weight and height of the study subjects were taken using a weighing scale fitted with stadiometer and body mass index were calculated. Serum creatinine was also analyzed and estimated glomerular filtration rate (eGFR) was calculated using the Cockcroft-Gault equation.

Data analysis: Statistical analysis was done using SPSS version 21.0 (SPSS IBM). Data was presented as mean ± standard deviation (SD) for continuous variables, while categorical variables were expressed as frequencies and proportion. Student t-test was used to compare mean values of continuous variables, while Fisher's exact and Chi square tests were used in comparing categorical variables. A p value of <0.05 was considered significant.

RESULTS

A total of two hundred and ninety one (291) consecutive subjects, comprising 134(46.1%) males and 157(53.9%) females were recruited. The mean age of the study population was 56.15±12.72, while that of the subjects with control and uncontrolled hypertension are 57.13±12.97 and 55.48±12.54 respectively with P = 0.275. Majority of the male study subjects are peasant farmers while the female are full time house wife. Quranic education is the common form of education among the study subjects; routine daily walk is the most common form of physical activity among the study population. Table 1 showed the social and demographic characteristics of the study population. The mean body mass index of the study population is 25.16± 5.41, subject with uncontrolled hypertension had higher mean BMI however the difference is not statistically significant P = 0.052. Similarly, female had higher mean BMI but the difference is not statistically significant P = 0.371. The study also showed a positive and significant correlation between BMI and systolic and diastolic blood pressure (P =0.011, r = 0.148) and (P = 0.008, r = 0.156) respectively. One hundred and nineteen (40.9%) subjects had controlled hypertension comprising 60 (20.6%) males and 59 (20.3%) females. While the remaining 172(59.1%) had uncontrolled hypertension comprising of 74(25.4%) males and 98(33.7%) females. There was a significant difference in the mean age at the diagnosis of hypertension between males and females (53.06±11.52 years and 44.32±12.32 years respectively, P <0.001). The duration of hypertension was also significantly longer in females (8.40±6.16 years) than males (7.02±6.17), p<0.001.

However, no significant difference was observed in the mean age as well as the age at diagnosis of hypertension between subjects with controlled and uncontrolled hypertension. The predominant pattern of uncontrolled hypertension among the study population is combined systolic and diastolic hypertension 95(32.6%), fifty-eight (19.9%) subjects had isolated systolic hypertension while 19(6.5%) had isolated diastolic hypertension. Among the subjects with uncontrolled hypertension, 99(34.0%) had grade 1 hypertension, 47(16.2%) had grade 2 hypertension and 26(8.9% had grade 3 hypertension. There was a significant difference in the mean systolic and diastolic blood pressure of subjects with controlled and uncontrolled hypertension 116.22±12.14, 153.14±18.17and 73.78±8.02,89.53±11.12 with a P-value = 0.001 and 0.001 respectively. However, no significant difference was observed in the duration of hypertension and body mass index between the subjects with controlled and uncontrolled hypertension. There was no significant difference in systolic blood pressure between the male and female study subjects (135.97±23.40mmHg) and females (139.81±24.79 mm Hg), p=0.17. However, females had significantly higher diastolic pressure than the males (84.52±12.58 mm Hg vs 81.42±12.51 mm Hg, p=0.03).

Fifty three (18.2%) were hypertensive-diabetics while 238(81.7%) had hypertension. Majority 37(69.0%) of the hypertensive-diabetics subjects had uncontrolled hypertension though there was no significant difference in the serum fasting glucose as well as the mean age at diagnosis of diabetes between the subjects with controlled and uncontrolled hypertension. Serum creatinine was significantly higher among the subjects with uncontrolled hypertension while estimated glomerular filtration was significantly lower among the subjects with uncontrolled hypertension (P value = 0.002 and 0.003 respectively). Table 2 showed the clinical characteristics of the study population.

Life style modification is a common treatment option across all the study subjects, and majority of the study population are on two or more anti-hypertensive medications comprising Calcium channel blockers, Angiotensin converting enzyme inhibitors/Angiotensin receptor blockers (ACEIs/ARBs) and Thiazide diuretics. There was a significant difference in the number of anti-hypertensive medication used among subjects with controlled and uncontrolled hypertension (χ^2 P=0.004)however, no significant difference was observed between male and female study subjects (Fishers exact P-value = 0.05). Table 3 showed the anti-hypertensive medication distribution among the study population.

Anti-hypertensive medication adherence among the study population was low, only 141(48.5%) had high adherence, while 111(38.1%) and 39(13.4%) had medium and low adherence respectively. Sub-analysis on the level of adherence among those with controlled and uncontrolled hypertension revealed that anti-hypertensive medication adherence was higher among the subjects with controlled hypertension compared to those with uncontrolled hypertension. Also significant difference was observed in adherence to anti-hypertensive medications between the males and females study subjects. Seventy three (54.5%) males and 68(43.3%) females had high adherence while50 (37.3%) males and 61(38.1%) females had medium adherence respectively. Eleven (8.2%) males and 28(17.8%) females had low adherence respectively (χ^2 P-value = 0.032). Among the subjects with low and medium adherence to anti-hypertensive medication, ignorance and medication cost were the major reasons for non-adherence identified (table 5).

Table 1 Demographic and social characteristics of the study population

Parameters	Controlled HTN (N=119)	Uncontrolled HTN (N=172)	P-Value
Age	57.13±12.97	55.48±12.54	0.275
Sex			
Male	60(50.42%)	74(43.0%)	
Female	59(49.57%)	98(56.9%)	Chi square = 0.213
Occupation			
Senior civil servant	11(9.2%)	13(7.6%)	
Junior civil servant	4(3.4%)	9(5.2%)	
Farmer	38(31.9%)	40(23.3%)	
Petty Trader	5(4.2%)	0(0.0%)	
Business	5(4.2%)	16(9.3%)	
Unemployed/Full time house wife	54(45.4%)	89(51.7%)	
Retired civil servant	1(0.8%)	2(1.2%)	
Driver	1(0.8%)	1(0.6%)	
Laborer	0(0.0%)	2(1.2%)	Fisher exact = 0.010***
Level of education			
No formal education	25(21.1%)	31(18.1%)	
Primary education	9(7.8%)	13(7.6%)	
Secondary education	4(3.4%)	14(8.1%)	
Quranic education	70(58.8%)	100(58.1%)	
Tertiary education	11(9.2%)	14(8.1%)	Chi square = 0.553
Level of physical activities			
No physical activities	5(4.2%)	12(7.0%)	
Daily routine walk	113(95.0%)	156(90.7%)	
Jogging	1(0.8%)	4(2.3%)	Fisher exact = 0.420

*** = P< 0.05

Table 2 Clinical characteristics of the study population

Parameters	Controlled HTN (N=119)	Uncontrolled HTN (N=172)	P-Value
SBP	116.22±12.14	153.14±18.17	0.001***
DBP	73.78±8.02	89.53±11.12	0.001***
BMI	24.41±4.73	25.68±5.79	0.052
Age at diagnosis of hypertension	49.66±12.94	47.43±21.95	0.150
Duration of Hypertension	7.48±5.37	7.96±6.72	0.523
Serum Creatinine	115.35±68.23	137.72±89.37	0.002***
Egfr	62.72±27.38	53.75±22.81	0.003***
Diabetes Mellitus			
Yes	16(13.4%)	37(21.5%)	
No	103(86.6%)	135(78.5%)	0.080
Duration of Diabetes	0.90±2.60	1.38±4.36	0.285
FBG	4.77±1.03	4.81±1.53	0.832
NSAID use			
Yes	1(0.8%)	85(49.4%)	
No	118(98.3%)	87(50.6%)	0.001***
Statin use			
Yes	6(5.1%)	3(1.7%	
No	113(95.0%)	169(98.3%)	0.166
Steroid/OCP use			
Yes	2(1.7%)	1(0.6%)	
No	117(98.3%)	171(99.4%	0.569

SBP = Systolic Blood Pressure, DBP = Diastolic Blood Pressure, BMI = Body Mass Index,
HTN = Hypertension, eGFR = estimated Glomerular Filtration Rate, DM = Diabetes Mellitus,
FBG = Fasting Blood Glucose, NSAID = Non-Steroidal Anti-Inflammatory Drugs,
OCP = Oral Contraceptive Pills, *** = P < 0.05

Table 3 Anti-hypertensive distribution among the study population

Antihypertensive used	Controlled HTN	Uncontrolled HTN
LSM+CCB+ACEI/ARB+ Thiazide diuretics	30(25.2%)	57(33.1%)
LSM+ACEI/ARB+Thiazide diuretic	25(21.0%)	21(12.2%)
LSM+CCB+ACEI/ARB	15(12.6%)	19(11.0%)
LSM+ACEI/ARB	13(10.9%)	12(7.0%)
LSM+CCB+Thiazide diuretic	11(9.2%)	11(6.4%)
LSM+CCB only	4(3.4%)	7(4.1%)
LSM+CCB+ACEI/ARB+ Thiazide diuretic+ methyldopa	2(1.7%)	9(5.23%)
LSM+BB=Thiazide diuretic	2(1.7%)	3(1.7%)
LSM+Methyldopa	1(0.8%)	4(2.3%)
LSM+CCB+BB+ACEI/ARB	1(0.8%)	3(1.7%)
LSM+CCB+BB	0(0.0%)	1(0.6%)
CCB+BB+ACEI/ARB+Thiazide diuretic	2(1.7%)	0(0.0%)
LSM+ACEI/ARB+Thiazide diuretic+ Methyldopa	1(0.8%)	7(4.1%)
LSM+Thiazide diuretic only	5(4.2%)	0(0.0%)
LSM+Thiazidediuretic+Methyldopa	2(1.7%)	2(1.2%)
LSM+BB only	1(0.8%)	0(0.0%)
LSM+BB+Methyldopa	1(0.8%)	0(0.0%)
LSM+CCB+Methyldopa	0(0.05)	2(1.2%)
LSM+BB+Thiazidediuretic+Methyldopa	0(0.0%)	1(0.6%)
LSM+ACEI/ARB+Methyldopa	0(0.0%)	3(1.7%)
LSM+CCB+ACEI/ARB+Methyldopa	0(0.0%)	3(1.7%)
LSM+BB+ACEI/ARB+Thiazide diuretic	0(0.0%)	1(0.6%)
LSM+BB+ACEI/ARB	0(0.0%)	1(0.6%)
LSM+CCB+Thiazidediuretic+Methyldopa	0(0.0%)	2(1.2%)
LSM+CCB+BB+Thiazide diuretic	1(0.8%)	0(0.0%)
LSM only		

ACEI/ARB= Angiotensin Converting Enzyme Inhibitor/Angiotensin Receptor Blocker, BB= Beta Blocker, CCB=Calcium Channel Blocker, LSM= Life Style Modification

Table 4 Level of anti-hypertensive medications adherence among the study population using the Morisky Medication Adherence Scale 4 (MMAS 4) Rearrange this table please

Level of adherence	Controlled HTN (N = 119)	Uncontrolled HTN (N = 172)	P-Value
HIGH **(n=141)**	86(61%)	55(390%)	
MEDIUM **(n=111)**	28(25.2%)	83(74.8%)	
LOW **(n=39)**	5(12.8%)	34(87.2%)	0.001***

*** = P < 0.05

Table 5 Reasons for non -adherence to anti-hypertensive medication among the study population

Reasons	Controlled HTN (N=119)	Uncontrolled HTN (N=172)	P-Value
No reasons	6(0.0%0	1(0.6%)	
Forgetfulness	0(0.0%)	5(8.1%)	
Ignorance	5(4.2%)	12(7.0%)	
Medication cost	75(6.7%)	93(11.0%)	
Pill burden	1(0.8%)	2(1.2%)	
Ignorance and medication cost	30(8.4%)	47(39.0%)	
Medication side effects	0(0.0%)	11(0.6%)	
Pill burden, medication cost, Medication side effects	2(0.0%)	1(0.6%)	0.001***

*** = P <0.05

DISCUSSION

In this cross-sectional study, majority of the participants were within the middle age category with female preponderance as previously reported by Igkbis et`al[12] This may be probably related to poor health seeking behavior of the males.[18] Majority of the female patients were unemployed full-time house wives depending on either their husbands or parents many of whom are peasant farmers. This low-socioeconomic status makes access to prescribed medication challenging, and could partly explain the high proportion of uncontrolled hypertension among the female subjects. Only few subjects attained tertiary level of education which probably explained the reason for poor adherence to medication.

Only 119(40.9%) subjects had controlled hypertension which implies that adequate blood pressure control is still a challenge among our hypertensive patients on medication as it was reported in previous studies across the world.[3-14] Subjects with uncontrolled hypertension had relatively higher BMI compared to those with controlled hypertension. In this study, we also observed a positive and significant correlation between BMI and both systolic and diastolic blood pressure. Female subjects had higher BMI, higher proportion of female subjects had uncontrolled hypertension compared to the male subjects. These suggest that obesity might be a contributing factor to the inadequate blood pressure control among our study subjects as it was previously demonstrated in the Framingham Heart Study and other studies.[19, 20] However, in this study there was no significant difference in the mean BMI of subjects with controlled and uncontrolled hypertension as well as the BMI of male and female subjects. This could be due to the fact that majority of the study population were unemployed with low socioeconomic status and increased physical activities for their daily livelihood. This might have contributed to the lack of significant difference in the body mass index of the subjects with controlled and uncontrolled hypertension as well as between the male and female subjects.

Interestingly our female subjects were younger than the males at the time of diagnosis of hypertension, and consequently, had a longer duration of hypertension. Plausible reason for the early detection of hypertension in females may due to the free access to health care services including blood pressure measurement of females of reproductive age group during ante-natal visit. The significantly higher diastolic blood pressure recorded among the female subjects may be attributed to the fact that the females were younger, this is in keeping with the Framingham heart study cohorts, which reported that diastolic hypertension was more prevalent than systolic hypertension in younger individuals.[21,22] Combined systolic and diastolic hypertension was the predominant pattern of hypertension in this study and majority of the hypertensive subjects had WHO grade I hypertension this is similar to what was previously reported by insert the name of this author here please et`al. [23]

Majority of the hypertensive-diabetics had uncontrolled hypertension compared to the subjects with only hypertension, this may suggest that diabetes mellitus might have contributed to the poor blood pressure control among the hypertensive-diabetics as previously reported by Kawther et`al. [24] In this study however, there was no significant difference in serum fasting glucose between the subjects with controlled and uncontrolled hypertension although glycated haemoglobin to determine long term glycaemic control was not done. This study also showed that subjects with uncontrolled hypertension had lower eGFR which also suggest that renal disease contribute to poor blood pressure control as reported previously.[25]

Concomitant use of oral contraceptive pills (OCP) or other form of steroids had been associated with poor blood pressure control[26, 27] but in this study, only 3(1.0%) out of 291(99.0%) subjects had OCP/steroids used and therefore cannot explained the level of poor blood pressure control observed in this study. Non-Steroidal Anti-Inflammatory Drugs (NSAID) use is a known confounding factor for poor blood pressure control,[28] this study also showed a significant difference in NSAID use between the subjects with controlled and uncontrolled hypertension and therefore might have contributed to the poor blood pressure control observed in this study population.

Lifestyle modification is constant across all the study subjects and majority of the study population were on two or more anti-hypertensive medications which comprised of Angiotensin converting enzymes inhibitors or Angiotensin receptor blockers, Calcium channel blockers and Thiazide type diuretics. This is in keeping with the recommendation of JNC 7 guideline on the prevention, detection, evaluation and treatment of high blood pressure.[29] In this study we also found that anti-hypertensive medication adherence was generally low particularly among female subjects. This finding is similar to study by Akintundeet`al[30] in their study on anti-hypertensive medications adherence among Nigerian hypertensive subjects in a specialist clinic compared to a general outpatient clinic, in which they reported 36.8%, 39.5% and 27% as high, medium and low adherence respectively though patients attending specialist clinic had higher medications adherence compared to those attending general outpatients clinic. Also Ebenezer et`al,[31] in their study on adherence to antihypertensive medications and some of its clinical implications in patients seen at a tertiary hospital in Nigeria reported that 44.7% had good adherence and 55.3% had poor adherence. Though their study categorized level of adherence into two (good and poor), this might have increased the level of adherence among their study population. Reasons identified to be responsible for the low and medium adherence in our study population were poverty and ignorance. This finding is similar to what was previously reported by Okwuonu et`al[32]where they reported forgetfulness and financial constraints as major factors responsible for patient-related barriers to anti-hypertensive medication adherence.

In conclusion therefore, our study revealed that blood pressure control among hypertensive patients on medication was not optimal and adherence to anti-hypertensive medication was also low. Decreased glomerular filtration rate, low anti-hypertensive medication adherence and NSAID use were found to be responsible for the inadequate blood pressure control observed in this study. Poverty and ignorance were major contributing factors for low medication adherence.

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