



EVALUATION OF BLOOD PRESSURE CONTROL AND ITS PREDICTORS AMONG HYPERTENSIVE PATIENTS RECEIVING TREATMENT IN A NIGERIAN HOSPITAL

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ABSTRACT

Despite treatment initiation, blood pressure (BP) control among hypertensive patients was mostly not achieved due to the effect of other associating factors. The objective of this study is to evaluate the BP control and factors affecting it among hypertensive patients in Specialist Hospital, Sokoto. A retrospective longitudinal design and systematic random sampling was used to select the records of 400 patients that were placed on antihypertensive medication(s) after diagnosis. Sociodemographic and clinical characteristics as well as 12-months medication and BP records of the patients were collected in a data collection form. The data were analysed for descriptive, chi-square, correlation and logistic regression statistics using SPSS version 20 at $p < 0.05$. Most of the patients (59.8%) were female with an average age of 52.7 ± 12.4 years. Methyldopa (31.0%), Amlodipine (28.9%) and Lisinopril (15.8%) were the most prescribed antihypertensives. Each patient was prescribed an average of 5.5 ± 1.9 different antihypertensives with 3.5 ± 1.2 changes in regimen within 12-months of treatment initiation. Only 47.0% of the patients had their BP controlled. Chi square and correlation analyses shows that female gender, younger age, baseline BP and frequent changes in regimen were significantly associated with poor BP control. Logistic regression model shows that the odds of BP being controlled is reduced by 87% and 37% for stage 2 hypertensives (OR = 0.13) and for every unit increase in the number of antihypertensives prescribed (OR = 0.63) respectively. In conclusion, patients in the facility had poor BP control. Female gender, younger age, baseline BP, and frequent changes in regimen were associated with poor BP control. Stage of hypertension and number of antihypertensives prescribed were the independent predictors of BP control. Adherence to guidelines and Pharmaceutical Care intervention are necessary for better patients' outcomes.

KEYWORDS: Blood Pressure Control, Hypertensive Patients, Predictors, Nigeria

INTRODUCTION

Globally the prevalence of hypertension and its related morbidity and mortality is on the increase [1]. As at the year 2015, there were about 1.13 billion, equivalent to about 20-24 % of people with hypertension worldwide [2]. In Nigeria, a systematic review revealed that the hypertension prevalence in adult is up to 47.2 % in the year 2015 [3].

Effective control of patients' blood pressure (BP) leads to desired therapeutic outcomes like preventing hypertension-related complications and

mortality which ultimately decreases the global burden of the disease.

Several studies on the BP control and its predictors among hypertensives were reported with different findings. Patients with uncontrolled BP were reported to be about 80 %, 51 %, 49 %, 25-60 % and 46 % from a study each conducted in Czech Republic [4], Spain [5], US [6], France [7] and Nigeria [8] respectively. Some reported factors associated with poor BP control include high baseline BP, old age, diabetes, obesity, black race, male gender, low income, non-adherence to clinic

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visits [5–12] and frequent change in treatment regimen [13].

The variability in the findings of BP control and factors affecting it shows that local data from different region or health centres is required to better understand the impact of treatment, factors affecting it and need for intervention. In this study area and setting, there were no adequate studies aimed at understanding the BP control and its predictors among patients being managed for hypertension. Hence, there is knowledge gap in that area which the finding of this study reduces.

METHODOLOGY

Study Design

A retrospective analysis of patients' records which were selected using systematic random sampling was conducted. A minimum of 360 patients' folders were estimated to be sufficient in representing the population of about 5,700 patients at 5% error margin and 95% confidence interval using Raosoft® sample size calculator [14].

Study Setting

The study was carried out in Specialist Hospital Sokoto, located in Sokoto state, North-western Nigeria. The hospital is a tertiary health care facility of 500 bed capacity. It provides speciality health services to people residing within the metropolis and also as a referral centre for primary and secondary health care facilities both within the state and from neighbouring states of Kebbi and Zamfara.

Inclusion and Exclusion Criteria

Included in this study were adult patients aged 18 years or older, diagnosed with hypertension, placed on at least one antihypertensive medication after diagnosis and must have been managed for at least 12 months. Also, patients must have had at least 4 clinic reviews within 12 months of treatment initiation. Hypertension in children and all cases of secondary hypertension like hypertension in pregnancy were excluded.

Ethical Considerations

The ethical approval for this study was obtained from the Ethics Committee of Specialist Hospital Sokoto. All data collected were handled confidentially.

Data Collection Instrument

A structured data collection form was designed to capture patients' sociodemographic and clinical characteristics. The form also captured 12 months antihypertensive medication and BP records of the patients based on Eighth Joint National Committee (JNC 8) on hypertension guidelines [15].

Data Collection

The data were collected between October and November 2016. Folders of patients that visited the clinic within each week were used. Every other folder that met the inclusion criteria was sampled and evaluated. A total of 400 patients' folders were used. For each folder, patient's sociodemographic and clinical characteristics were collected. Also, patients' 12 months medication and BP records, from the date of treatment initiation were collected. Only records of patients diagnosed within 5 years (2011 to 2015) were used.

Data Analysis

The collected data were coded and entered into Statistical Product and Service Solutions (SPSS) version 20.0 for analysis. Descriptive statistics was used to analyse the sociodemographic and clinical characteristics of the patients. Chi square and correlation analyses were used to evaluate the association between patients' sociodemographic and clinical characteristics with 12-months BP control of the patients. Logistic regression analysis was used to identify the independent predictors of BP control. Level of significance was set at $p < 0.05$

RESULTS

Result of this study shows that majority of the 400 patients evaluated were female (59.8 %) with an average age of 52.7 ± 12.4 years. Their average baseline systolic and diastolic BP were 179.3 ± 25.7 and 105.7 ± 13.1 mmHg respectively. Most of the patients (83.8 %) belong to clinical stage 2 of the disease prior to treatment initiation. See table 1. Majority of the patients (74.5) had no any comorbidity with the most common being diabetes mellitus (20 %).

Methyldopa (31.0 %), Amlodipine (28.9 %) and Lisinopril (15.8 %) were the most prescribed antihypertensives. The average number of antihypertensives prescribed per patient within 12 months of treatment initiation was 5.5 ± 1.9 , with about 3.5 ± 1.2 changes to the medications (treatment plan) within the same period. On the average, each patient was managed with 6.9 ± 1.9

drugs for chronic disease, including non-antihypertensives within the 12 months.

From table 2, only 188 (47.0 %) of the patients had their BP controlled after 12 months of treatment initiation. Chi square analysis shows that female gender ($p = 0.000$) and stage 2 hypertension ($p = 0.000$) were significantly associated with poor BP control. In table 3, Pearson bivariate correlation analysis shows that age ($p = 0.048$) was significantly associated with BP control. Baseline systolic (- 0.522) and diastolic BP (- 0.474),

baseline clinical stage (- 0.359), number of changes (- 0.285), number antihypertensives prescribed (- 0.362) and total number of medications prescribed (- 0.333) were all significantly associated with BP control at $p = 0.000$. Logistic regression model shows that the odds of BP being controlled is reduced by 87% when a patient is stage 2 hypertensive at baseline (OR = 0.13, $p = 0.000$) while the odds is reduced by 37% for ever unit increase in the number of antihypertensive prescribed (OR = 0.63, $p = 0.000$).

Table 1: Sociodemographic and baseline clinical characteristics of the patients, N=400

Variable	Frequency (%)
<i>Gender</i>	
Female	239 (59.8)
Male	161 (40.2)
<i>Clinical Stage</i>	
Stage 1	65 (16.2)
Stage 2	335 (83.8)
<i>Comorbidity</i>	
None	298 (74.5)
Diabetes Mellitus	80 (20.0)
Heart Failure	18 (4.5)
Cerebrovascular Accident	3 (0.7)
Chronic Kidney Disease	1 (0.3)
<i>Commonly Used AHMs</i>	
Methyldopa	124 (31.0)
Amlodipine	119 (28.9)
Lisinopril	63 (15.8)
Amiloride/HCT	23 (5.8)
HCT	20 (5.0)
Ramipril	19 (4.8)
Nifedipine	8 (2.0)
Spironolactone	6 (1.5)
Perindopril/Indapamide	6 (1.5)
Furosemide	4 (1.0)
Bendroflumethiazide	2 (0.5)
Losartan	2 (0.5)
Atenolol	2 (0.5)
Metolazone	2 (0.5)
AHMs = Antihypertensive medications; BP = Blood pressure; HCT = Hydrochlorothiazide	

Table 2: Effects of Gender, Clinical Stage, Number of Changes and Number of Antihypertensive Medications on BP Control, N=400

Variables		BP Not Controlled – n (%)	BP Controlled – n (%)	Total within variables – n (%)	p-value for Pearson χ^2
<i>Gender</i>					
	Male	68 (42.2)	93 (57.8)	161 (100.0)	0.000*
	Female	144 (60.3)	95 (39.7)	239 (100.0)	
	Total	212 (53.0)	188 (47.0)	400 (100.0)	
<i>Baseline Clin Stage of HTN</i>					
	Stage 1	8 (12.3)	57 (87.7)	65 (100.0)	0.000**
	Stage 2	204 (60.9)	131 (39.1)	335 (100.0)	
	Total	212 (53.0)	188 (47.0)	400 (100.0)	
<i>No of Changes to AHMs^a</i>					
	0	0 (0.0)	4 (100.0)	4 (100.0)	0.000**
	1	4 (16.0)	21 (84.0)	25 (100.0)	
	2	16 (34.0)	31 (66.0)	47 (100.0)	
	3	58 (50.4)	57 (49.6)	115 (100.0)	
	4	83 (61.0)	53 (39.0)	136 (100.0)	
	5	48 (71.6)	19 (28.4)	67 (100.0)	
	6	2 (66.7)	1 (33.3)	3 (100.0)	
	7	1 (33.3)	2 (66.7)	3 (100.0)	
	Total	212 (53.0)	188 (47.0)	400 (100.0)	
<i>No of AHMs prescribed^a</i>					
	1	0 (0.0)	2 (100.0)	2 (100.0)	0.000**
	2	4 (23.5)	13 (76.5)	17 (100.0)	
	3	8 (25.8)	23 (74.2)	31 (100.0)	
	4	15 (23.4)	49 (76.6)	64 (100.0)	
	5	50 (52.6)	45 (47.4)	95 (100.0)	
	6	57 (65.5)	30 (34.5)	87 (100.0)	
	7	36 (65.5)	19 (34.5)	55 (100.0)	
	8	33 (91.7)	3 (8.3)	36 (100.0)	
	9	3 (42.9)	4 (57.1)	7 (100.0)	
	10	3 (100)	0 (0)	3 (100.0)	
	11	3 (100)	0 (0)	3 (100.0)	
	Total	212 (53.0)	188 (47.0)	400 (100.0)	

BP = Blood pressure; χ^2 = Chi Square; Clin = Clinical; HTN = Hypertension; AHMs = Antihypertensive medications; ^a within 12 months of Treatment Initiation.

Table 3: Factors associated with blood pressure control of the patients, N=400

Variables	Mean ± SD	Pearson Bivariate Correlation		Logistic Regression Model	
		Coefficient	p-value	OR (95% CI)	p-value
Age of the Patients (years)	52.7±12.4	0.107	0.048*	-	-
Baseline Systolic BP (mmHg)	179.3±25.7	- 0.522	0.000**	-	-
Baseline Diastolic BP (mmHg)	105.7±13.1	- 0.474	0.000**	-	-
Baseline Clinical Stage of HTN	-	- 0.359	0.000**	0.13 (0.05-0.26)	0.000**
No of Changes to AHMs ^a	3.5±1.2	- 0.285	0.000**	-	-
No of AHMs prescribed ^a	5.5±1.9	- 0.362	0.000**	0.63 (0.54-0.73)	0.000**
Total No of drugs for chronic dx	6.9±1.9	- 0.333	0.000**	-	-
Constant	-	-	-	622.83	-

OR = Odds Ratio; CI = Confidence Interval; AHMs = Antihypertensive medications: ^a within 12 months of Treatment Initiation; dx = Disease; HTN = Hypertension; BP = Blood Pressure;

DISCUSSION

From the result, the affected patients are mostly above fifty years of age this may be due to the fact that hypertension is most common in aged individual. Among the patients evaluated, about 60% of them were female which suggest that females are at higher risk, probably due to their low physical activities compare to male. In the study area most of the female engage in occupations that did not involve much physical activities which support their sedentary life style. Patients on stage 2 hypertension at baseline account for 83.8% of the population. This shows the extent in which hypertension affect this population and the need for good management approach for the patients.

The most common co-morbidity was observed to be diabetes which could be due to the fact that most diabetics are hypertensive. However, hypertension being a cause of diabetes is yet to be established. Some complications of hypertension like heart failure and cerebrovascular accident and chronic kidney disease were also observed among the population. Those complications could be due to the fact that most Nigerians have poor attitude towards regular medical check-ups [16,17]. Hence, most hypertensives are unaware of their condition until complications are observed before they report to the hospitals [18,19]. Also, some studies revealed that and hypertension related

complications are more common among black population [6,11]. These findings expose the need for immediate intervention in terms of public enlightenment on hypertension, patients' education and proper management.

The result also shows that about 14 different antihypertensive medications were used in the facility. The most common were Methyldopa, Amlodipine then Lisinopril. The predominance of methyldopa could be attributed to its low cost or physicians' experience with the drug. It could also be due to prescribers' poor attitude towards compliance with the JNC recommendation for first line regimen which is not methyldopa according to JNC 7 and 8 [15,20]. The use amlodipine and lisinopril as well as the most prescribed diuretics (Amiloride + Hydrochlorothiazide and Hydrochlorothiazide) are all in line with JNC recommendation as monotherapy or combination depending on the patients' presenting clinical situation. In addition, lisinopril use could be attributed to the recommendation of Angiotensin Converting Enzymes Inhibitors (ACEIs) in hypertension–diabetes co-morbidly [15,20].

It was also observed that on the average, each patient in the facility was prescribed 5.5 different antihypertensives leading to a total of 6.9 medications for chronic conditions with about 3.5

changes in treatment regimen within 12 months of treatment initiation. The number of prescribed antihypertensives is high compare to that of a similar study which was found to be 2.5 per patient [21]. The frequency of changes in treatment regimen suggests that in the facility, at almost every clinic visit, there could be change in patient's treatment regimen. This is the reason for high number of antihypertensive and other medications prescribed per patient per year. A study needs to be conducted to properly evaluate the reasons for this frequent change in treatment regimen. However, some possible reasons could be prescribers' poor attitude towards the available treatment guidelines, influence of pharmaceutical companies on prescribers' decision, lack of proper review of patients' history before prescription, lack of patients' adherence to their medication and lack of adequate pharmaceutical care services by Pharmacists. The problem of inappropriate change in treatment regimen by prescribers on hypertensive patients was also reported in a similar study [22]. Studies have reported that too many changes in antihypertensive regimen leads to poor BP control [13,21].

The findings of this study revealed that less than half of the patients had their BP being controlled after 12 months of treatment initiation. This is an indication of poor patients' management in the facility and the need for every stakeholder in the management of those patients to optimise their effort in ensuring better patients' outcomes. Also, frequent changes in treatment regimen as observed in this study could be another major factor leading to poor BP control. A study conducted among Nigerian population also reported similar finding [8]. However, the finding was different in some studies conducted outside Nigeria [4–7]. The difference could be attributed to difference in the population, quality of patients' management and study design and analysis.

Some sociodemographic and clinical characteristics were observed to affect patients' BP control. Female gender was observed to be associated with poor BP control compare to their male counterpart. It was observed in this study that female patients were more than male. Hence, the possible factors like low physical activities that must have led to higher number of female hypertensives could have contributed to poor BP control. Conversely, many studies reported male gender to be more associated with poor BP control [6–8,11].

Furthermore, younger age, higher baseline BP, higher clinical stage, number of changes to regimen, number of antihypertensive and other

medications were observed to be associated with poor BP control. Independent predictors of BP control were identified to be stage of hypertension and number of antihypertensives prescribed with the odds of BP being uncontrolled to be 87 % and 37 % for every unit increase in the two factors respectively. Similar findings were also reported [6,7,9,11,13,21].

The limitation of this study is that it is retrospective. Prospective study could give a better control of the study participants and improve the efficiency of data collection.

CONCLUSION

Less than half of the patients achieved the desired BP control. Baseline BP, younger age, number of changes to regimen and number of medications were associated with poor BP control. The independent predictors of BP control were clinical stage of hypertension and number of antihypertensive medications. There is pressing need for intervention in terms of adherence to JNC guideline for the management of hypertension, multidisciplinary approach in patients' management and Pharmaceutical Care in the facility for better patients' outcome.

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