

Drug prescription/blood pressure control in patients on monotherapy attending a tertiary hospital in Nigeria

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ABSTRACT

Background: Current treatment guidelines for treatment of hypertension stipulate the use of diuretics or calcium channel blockers (CCBs) as first-line treatment. Although, many studies have been carried out to study prescription pattern and blood pressure (BP) control in this region none has independently compared the effect of different antihypertensive drug classes given as monotherapy on BP control. This study compares the BP lowering efficacy of different classes of antihypertensive drugs given as monotherapy in black hypertensive patients with or without complications.

Methods: This prospective cross-sectional study evaluated the influence of antihypertensive prescription on BP controls among consecutive patients present on clinic days from November 2011 to April 2012. Patients were treated with either angiotensin-converting enzyme inhibitor, angiotensin receptor blocker, beta-blocker, CCB, centrally acting adrenergic drug or diuretic. The primary outcome was BP reading <140/90 mmHg in patients without complication or <130/80 mmHg in patients with complication.

Results: Of 264 patients, 228 patients received one drug whereas 36 received no drug. More than half of those on non-pharmacological intervention had good BP control (n=21), patients on diuretic (28.8%) had a significantly higher BP control (p=0.014) than those on other classes of drugs. Only 58% of the patients had good BP control. Diastolic BP reduced with an increase in age.

Conclusions: In this study, diuretics significantly reduced BP compared with other antihypertensive class. Although clinical trials also suggest the use of CCB as first-line treatment, cost considerations are necessary.

Keywords: Hypertension, Drug utilization, Monotherapy, Nigeria

INTRODUCTION

Hypertension is a very important, but modifiable risk factor in the development of cardiovascular diseases.¹ Prevalence of hypertension has been estimated to be about 1 billion of the world population with an estimated 65.7% in economically developing countries, a 60% increase in the number of hypertensive individuals globally is predicted by 2025.² In Nigeria, The disease burdens attributable to high blood pressure (BP) is enormous in terms of economic consequences, a meta-analysis study showed the prevalence of hypertension to be between 8% and 46.4% depending on the study target population, type of measurement and cut-off value used for defining hypertension.³ BP reduction prevents end organ damage, which may further complicate the disease, reduction of BP by 10 mmHg systolic or 5 mmHg diastolic can lower mortality from cardiovascular diseases,⁴ it is recommended

that BP be <140/90 in patients without compelling indications and <130/80 in patients with compelling indications⁵ although a more aggressive approach is recommended for blacks.⁶

The goal of drug therapy in the management of hypertension is to lower BP to acceptable thresholds. Meta-analysis studies showed equal efficacy of the various antihypertensive drug classes to reduce BP with some drug classes preventing secondary end point diseases such as stroke, renal diseases, heart failure,^{7,8} however, it is recommended that for patients of African origin, diuretics or calcium channel blockers (CCBs) be the first line of treatment especially as mono-therapy.⁵ The quality of prescription is an important factor especially in the management of chronic diseases. Prescription of drugs should be based on several factors, some of which include improvement of clinical outcome of disease, patients' adherence to therapy and cost.

The prescription pattern of antihypertensive drugs among physicians and BP control among sub-sets in Nigeria has been extensively studied⁹⁻¹¹ but no study has been exclusively carried out in recent times to assess the impact of individual antihypertensive drug class on BP control in a sizable hypertensive population. This study aims at evaluating the effect of individual antihypertensive drug class on BP control among patients with or without complications/co-morbidity attending a tertiary hospital in southwest Nigeria. This information could be useful in improving the quality of drug prescription among blacks, thereby, effectively controlling high BP, consequently reducing the number of deaths attributable to cardiovascular diseases.

METHODS

Study population and design

This was a prospective cross-sectional study of antihypertensive prescriptions in consecutive hypertensive patients attending three out-patients clinics of the University College Hospital (UCH), Ibadan, Oyo State. Inclusion criteria included hypertensive patients between the ages of 30-85 years, who were on mono-therapy or non-pharmacological treatment for the study duration. Individuals not meeting these requirements were excluded from this study. The study was carried out from November 2011 to April 2012. Ethical approval for this study was given by the University of Ibadan (UI)/UCH ethical review committee. Data from patient's case notes including patients' demographics, compelling indications, antihypertensive drug prescribed and BP readings were collected after each clinic. Each patient had at least two BP readings; the average was used for analysis. Patients were grouped according to treatment received, either pharmacologic or non-pharmacologic. In this study, antihypertensive drugs received by patients were classed into six namely - centrally acting adrenergic drugs (CAAD), beta-blockers (BBs), calcium channel blockers (CCBs), angiotensin-converting enzyme inhibitor (ACEI), angiotensin receptor blocker (ARB) and diuretics (D).

Outcome

Primary outcome was reduction of BP to acceptable thresholds⁵ by different regimen employed in this study. BP reading of systolic pressure <140 and diastolic pressure <90 was classified as controlled, systolic pressure more than 140 and diastolic pressure more than 90 was classified as uncontrolled BP. Patients with systolic pressure <140, but had diastolic pressure >90 were said to have only systolic BP (SBP) controlled while those with systolic pressure >140 and diastolic pressure <90 had only diastolic BP (DBP). In patients with complications, SBP and DBP had to be <130 and 80 respectively to be considered as controlled.

Statistical analysis

Descriptive statistics was used for data presentation, Chi-square statistics was used to determine the effect of antihypertensive drug classes on BP control. Correlation and multiple regression were carried out to examine the relationship between BP control and predictive variables (age, sex, number of health problems, and antihypertensive drug prescription). Data analysis was performed using SPSS version 17 (SPSS Inc. Released 2008. SPSS Statistics for windows, version 17.0 Chicago:SPSS Inc.).

RESULTS

A total number of 264 patients met the inclusion criteria, 154 (58.3%) were female while 110 (41.7%) were male (Table 1). Most patients were above 60 years (Table 2), the mean age of patients was 60.09±12.20. Diabetes mellitus and cardiovascular disease were the compelling indications most encountered among hypertensive patients on monotherapy, 50 (18.9%) patients were diabetic and 38 (14.4%) had heart-related diseases. Antihypertensive drugs were prescribed to 228 (86.4%) patients while 36 (13.6%) patients were on non-pharmacological treatment (Table 3). Most patients were on diuretics and CCBs (28.8% and 26.9% respectively), with patients on diuretics having a significantly higher BP control than patients on other antihypertensive drug class, centrally acting adrenergic drugs and BBs were the least prescribed drug classes (in 1.5% and 1.9% prescriptions respectively), ACEI and ARB made up 23.5% and 3.8% of prescriptions (Table 3). Poor BP control was observed, only 153 (58%) patients had optimal BP control, 53 (20.1%) had fully uncontrolled hypertension, while 42 (15.9%) and 16 (6.1%) patients had only DBP and SBP controlled respectively (Table 3). There was a significant correlation between age and DBP, $r=-0.25$, $p=0.00$, but age did not significantly correlate with SBP, $r=-0.071$ ($p=n.s$). Results from multiple regression analysis used to test DBP and predictive variables ($R^2=0.65$, $F [4,258] = 4.50$, $p<0.01$) indicated that age significantly predicted DBP levels ($\beta=-0.24$, $p=0.00$). None of the variables significantly predicted SBP.

Table 1: Demographic parameters of hypertensive patients on monotherapy attending the University College Hospital, Ibadan between Nov. 2011 and Apr. 2012.

Age	Sex		Total (%)
	Male	Female	
30-39	9	6	15 (5.7)
40-49	25	13	38 (14.4)
50-59	47	26	73 (27.7)
60-69	43	27	70 (26.5)
70-79	21	29	50 (18.9)
≥80	9	9	18 (6.8)
Total (%)	154 (58.3)	110 (41.7)	264 (100)

Table 2: BP control across age groups in patients attending out-patients clinic of the University College Hospital Ibadan between Nov. 2011 and Apr. 2012.

Age (years)	BP control				Total (%)
	Fully controlled	Fully uncontrolled	Only SBP controlled	Only DBP controlled	
30-39	6	6	2	1	15 (5.7)
40-49	24	7	2	5	38 (14.4)
50-59	45	12	8	8	73 (27.7)
60-69	32	16	2	20	70 (26.5)
70-79	32	11	2	5	50 (18.9)
≥80	14	1	-	3	18 (6.8)
Total (%)	153 (58.0)	53 (20.1)	16 (6.1)	42 (15.9)	264 (100)

BP: Blood pressure, SBP: Systolic BP, DBP: Diastolic BP, *p<0.05 between groups

Table 3: Drug prescription/BP control in patients attending clinics at University College Hospital Ibadan between Nov. 2011 and Apr. 2012.

Drug class	BP control				Total (%)
	Fully controlled	Fully uncontrolled	Only SBP controlled	Only DBP controlled	
No drug	21	10	2	3	36 (13.6)
Centrally-acting adrenergic drug	1	1	2	-	4 (1.5)
BB	3	1	1	-	5 (1.9)
CCB	35	17	4	15	71 (26.9)
ACEI	35	16	2	9	62 (23.5)
ARB	5	3	-	2	10 (3.8)
D	53	5	5	13	76 (28.8)
Total (%)	153 (58.0)	53 (20.1)	16 (6.1)	42 (15.9)	264 (100)

BB: Beta blockers, CCB: Calcium channel blockers, ACEI: Angiotensin-converting enzyme inhibitor, ARB: Angiotensin receptor blocker, D: Diuretics, BP: Blood pressure, SBP: Systolic BP, DBP: Diastolic BP, *p<0.05 between groups

Prescription/BP controls in hypertensive patients with cardiovascular disease

A total of 38 patients had hypertension with cardiovascular disease, only 1 patient received no drug. Diuretics were the drug of choice among patients with heart related diseases, 19 (50%) of the 38 patients were on diuretics (Table 4). All but one of the 19 patients that received this drug class had optimal BP control. ACEI was prescribed to 8 (21.1%) patients, CCB to 5 (13.2%) patients, ARB to 3 (7.9%) patients. Centrally acting adrenergic drugs and BBs were each prescribed to 2.6% of patients. Twenty-seven patients had good BP control while poor BP control was observed in 11 patients (Table 4).

Prescription/BP controls in hypertensive patients with diabetes mellitus

Fifty patients had hypertension with diabetes mellitus, 4 of the 8 patients that received no drug had optimal BP control. Diuretics and centrally acting adrenergic drugs were not prescribed to patients. 27 (54%) patients were on ACEI, only a half of them had their BP controlled. Patients on CCB (24%) had poor BP control, none of the 2 (4%) patients on

ARB had their BP controlled. The only patient on BB had good BP control (Table 5).

DISCUSSION

BP control remains a serious concern especially in sub-Saharan Africa, reports from Nigeria indicate poor BP controls albeit the use of antihypertensive drugs.¹²⁻¹⁴ Inadequate BP control could be as a result of several factors, but rational drug prescription taking into account racial differences, financial implications, and adverse effect could improve BP control. BP control in this study was poor; this finding is similar to studies carried out in this region. Non-pharmacological therapy including lifestyle changes should be the first approach in high BP management, drug therapy should be initiated when lifestyle modifications alone fail to lower BP to acceptable thresholds. Lifestyle changes, such as weight reduction, low salt diet, reduced alcohol consumption and adopting the dietary approaches to stop hypertension diet, have been shown in clinical trials to lower BP,^{15,16} 21 of the 36 patients on only lifestyle modification attained optimal BP (Table 3). Patients, even those on antihypertensive medication, should be encouraged to improve their lifestyle for better clinical outcomes, this is especially true for those of in Nigeria, where

Table 4: Drug prescription/BP control in hypertensive patients with cardiovascular disease attending clinics of University College Hospital, Ibadan.

Drug class	BP control				Total (%)
	Fully controlled	Fully uncontrolled	Only SBP controlled	Only DBP controlled	
No drug	1	-	-	-	1 (2.6)
Centrally-acting adrenergic drug	1	-	-	-	1 (2.6)
BB	-	-	1	-	1 (2.6)
CCB	1	1	-	3	5 (13.2)
ACEI	4	3	-	1	8 (21.1)
ARB	2	-	-	1	3 (7.9)
D	18	-	-	1	19 (50)
Total (%)	27 (71.1)	4 (10.5)	1 (2.6)	6 (15.9)	38 (100)

BB: Beta blockers, CCB: Calcium channel blockers, ACEI: Angiotensin-converting enzyme inhibitor, ARB: Angiotensin receptor B, D: Diuretics, BP: Blood pressure, SBP: Systolic BP, DBP: Diastolic BP, *p<0.05 between groups

Table 5: Drug prescription/BP control in hypertensive patients with diabetes mellitus attending clinics of the University College Hospital Ibadan.

Drug class	BP control				Total (%)
	Fully controlled	Fully uncontrolled	Only SBP controlled	Only DBP controlled	
No drug	4	2	1	1	8 (16.0)
Centrally-acting adrenergic drugs	-	-	-	-	-
BB	1	-	-	-	1 (2.0)
CCB	4	6	-	2	12 (24)
ACEI	14	11	-	2	27 (54)
ARB	-	2	-	-	2 (4)
D	-	-	-	-	-
Total (%)	23 (46)	21 (42)	1 (2.0)	5 (10)	50 (100)

BB: Beta blockers, CCB: Calcium channel blockers, ACEI: Angiotensin-converting enzyme inhibitor, ARB: Angiotensin receptor B, D: Diuretics, BP: Blood pressure, SBP: Systolic BP, DBP: Diastolic BP, *p < 0.05 between groups

poor diet and increased sodium chloride intake is common. Optimal adherence to life style modification reduces SBP by more than 10 mmHg¹⁷ and optimal adherence to life style modification, including cessation of smoking, also reduces cardiovascular disease mortality.¹⁸ Although current guidelines for treatment of hypertension advocate the use of diuretics and CCBs as first line therapy in treatment of hypertensive patients of Afro-Caribbean descent, diuretics should be preferentially prescribed as single drug therapy because of cost benefits. Diuretics have also been proven over time to be effective in treatment of hypertension in blacks because of their pathophysiology, which include low renin levels, salt sensitivity, and impaired salt excretion. It was superior in preventing the cardiovascular complications of hypertension in the antihypertensive and lipid lowering treatment to prevent heart attack trial.⁸ Most patients in this study were on diuretics (28.8%), CCBs (26.9%) were prescribed almost as much as diuretics, this differs from other studies where other antihypertensive drug classes were preferentially prescribed. Amira and Okubadejo reported CCBs as the most prescribed mono-therapy, 16 of 51 patients on single drug therapy received it, this was

followed by ACEIs prescribed to 10 patients, 45.1% of the patients had their BP controlled with patients on diuretics having the highest BP control.⁹ Other earlier studies also confirmed CCBs as the most prescribed drug followed by ACEIs and ARB¹⁰ or diuretics.¹¹ The slight shift from CCBs back to diuretics could be observed in prescriptions. Indeed patients on diuretics in this study had a significantly better BP control than those on other drug classes. Decreased diuretic prescription may be because of compelling indications, none of the diabetic patients (18.9%) received diuretics, but were mostly prescribed ACEI, reports from another study corroborates ACEI as the drug of choice in managing diabetic hypertensives because it reduces progression of diabetic nephropathy,^{9,19} diuretics have been found to induce hypokalemia and hyperglycemia in patients²⁰ although the benefit outweighs the risk for most but not all patients.²¹ BP control in this group of patients was poor. Patients with heart related diseases predominantly received diuretics and had good BP control. Although, overall BP control was less than adequate (58.0%), it was higher than BP control in other studies where CCB was the most prescribed drug as monotherapy, 45.1% (n=51),⁹ 40.6% (n=69).¹¹ Surprisingly,

individuals 80 years and above had a better BP control than those younger, all 5 on diuretics had their BP fully controlled. Of the 8 on CCB, 6 had fully controlled BP, 3 out of the 4 on ACEI had controlled BP while the only one on ARB had uncontrolled BP. Generally, prescription of centrally acting adrenergic drugs and BBs were minimal, these drug classes are not recommended as first-line treatment in hypertensive patients of African origin.⁸ Low prescription of ARB would be because of the high cost of acquiring these drugs. DBP reduced significantly with increasing age, this is similar to reports from another study.²¹

In summary, diuretics remain effective as monotherapy in blacks for treatment of hypertension, its effectiveness coupled with low cost makes it preferable compared with other drug classes. Poor BP control needs to be addressed in Nigeria. Life-style modifications should be encouraged among patients, even those on medication because of perceived benefits it offers.

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