Published by

British Journal of Contemporary Research

BEXFORD PUBLISHING

Antihypertensive Drug Prescriptions Pattern and the Impact on Blood Pressure of Nigeria Hypertensive Patients

Original Research Article | Volume 1 | Issue 6 | 2026 | Article Number: 063

Accepted: 31 October 2026 | Published: 10 November 2026 | ISSN: 2979-8582 (Online)

Crossref : **https://doi.org/10.67693/BJCR-6F7USP9G**

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Abstract

Background: Hypertension is a leading cause of premature death globally and its prevalence is higher in low-and-middle income countries (LMICs) than in high countries. Studies on prescription patterns of ant-hypertensive found inconsistencies, thereby necessitating thorough investigations into the prescribing practices.

Method: The study was a retrospective, descriptive, cross-sectional study of antihypertensive medicines prescriptions conducted at the Medical Outpatient Department of a tertiary hospital in southeastern part of Nigeria. Data were analyzed using Statistical Packages for Social Sciences software version 23.0 for windows and an independent sample t-test was used to determine the effect of identified drug related problems on the patients BP control. A p-value < 0.05 was regarded as statistically significant with 95% confidence interval to test the level of significance.

Results: Bitherapy (45.36%) was the most common used form of prescribed therapy. Adverse drug reactions is one of the identified drug related problems and was statistically significant at p-value < 0.001 in the BP controlled versus uncontrolled group. Among the monotherapy prescribed, calcium channel blockers (CCB) had the highest systolic blood pressure (SBP) and diastolic blood pressure (DBP) mean value reductions of 31.14 mmHg and 16.00 mmHg, respectively . Among the combination therapies prescribed, CCB + THZ (Thiazide-type diuretics) + ACEI (Angiotensin Converting Enzymes Inhibitors) showed the highest SBP and DBP mean value reductions with 30.22 mmHg and 17.62 mmHg respectively

Conclusion: Majority of the healthcare providers in the hospital adhered to the hypertension treatment guidelines. The average number of prescription per encounter were more than two anti-hypertensive medications and a few number of anti-hypertensives were prescribed using brand names. Patients experienced adverse drug reactions more than any other identified drug related problems. Calcium Channel

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Blockers, Thiazide-type diuretics and their combination-based were more effective in reducing both the systolic blood pressure and diastolic blood pressure compared to other agents.

Keywords: Antihypertensives, Prescriptions, Blood Pressure, Patients

INTRODUCTION

Background of the Study

Hypertension is a disease of global health importance (14, 15, 24) since as much as 1.4 billion people were estimated to have high blood pressure (14). It is a leading cause of premature death globally and its prevalence is higher in low-income and middle-income countries (LMICs) than developed countries (15, 24). As at 2015, as much as 8.5 million deaths were estimated and attributable to diastolic blood pressure > 115 mmHg, 88% of which were in low-income and middle-income countries (24). This burden of cardiovascular disease is on the increase in developing countries where a pooled prevalence of hypertension is 34% (16). The World Health Organization (WHO) 2006 guidelines on antihypertensive medication prescription patterns emphasize the importance of evidence-based treatment selection based on the specific needs of patients and the resources available in different regions (22). The guidelines aim to reduce the burden of hypertension by recommending treatments that balance efficacy, affordability, and accessibility. It categorizes antihypertensive medications into various classes, including thiazide diuretics, beta-blockers, calcium channel blockers, ACE inhibitors, and angiotensin II receptor blockers (ARBs). However, the 2008 Joint National Committee on hypertension (JNC 8) recommendations for the treatment of hypertension include: I) Starting pharmacological therapy for individuals with diabetes mellitus and chronic kidney disease with BP greater than or equal to 140/90 mm Hg to therapeutic target BP less than 140/90 mm Hg, ii) Starting pharmacological therapy for individuals 60 years of age and over with BP greater than or equal to 150/90 mm Hg to therapeutic target BP less than 150/90 mm Hg, iii) starting pharmacological therapy for individuals 18 to 59 years of age with systolic blood pressure (SBP) greater than or equal to 140 mm Hg to therapeutic target SBP less than 140 mm Hg, iv) Individuals with diabetes mellitus and non-black population, treatment should include a thiazide diuretic, Calcium Channel Blockers (CCB), and an Angiotensin Converting Enzyme Inhibitor (ACEI)/Angiotensin Receptor Blockers (ARB), v) Individuals in the black population, including those with DM, treatment should include a thiazide diuretic and Calcium Channel Blockers, vi) Individuals with chronic kidney disease (CKD), treatment should be started with or include ACEI/ARB, and this applies to all CKD patients irrespective of race or DM status (12). WHO encourages general practitioners to follow evidence-based recommendations to improve treatment outcomes. The familiarity with WHO-recommended therapies, knowledge of drug efficacy, and side-effect profiles significantly influence prescription patterns (22). Despite the availability of hypertension treatment guideline and wide range of antihypertensive drugs, yet several studies highlight significant challenges in the use of antihypertensive in health clinics. In particular, studies on prescriptions of antihypertensive found inconsistencies in recommended guidelines for the management of hypertension (7, 9, 13) thereby increases the risk of adverse drug reactions, complicates the management of the patient's overall treatment and potentially resulting in poor adherence.

Considering the complexities that surround the prescriptions of antihypertensive agents, it is necessary to have thorough investigations in the prescribing practice and its' impact on the patients' treatment outcomes.

Keeping this in mind, our study aimed to evaluate the antihypertensive drug prescription patterns and their

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impact on blood pressure using Enugu State University Teaching Hospital in Enugu state, Nigeria. It specifically; assessed the extent of the prescribers' compliance with the hypertension treatment guideline; identified the drug related problems associated with the use of the antihypertensive drugs; evaluated the extent of the blood pressure control with the identified drug related problems; and compared the effect of antihypertensive regimen prescribed on the reduction of systolic and diastolic blood pressure among the patients.

METHOD

Study Setting/Area

This study was conducted at the Medical Outpatient Department of the Enugu State University Teaching Hospital, Parklane in Enugu, Southeastern part of Nigeria, from 14th May 2025 through November 2025. The hospital serves as a teaching hospital for the Enugu State University medical and other related health science programs, and receives referrals from hospitals within and outside the state. The healthcare facility is equipped with an electronic prescription database, making it feasible to track patients' prescriptions histories and assess drug prescription patterns.

Study Design:

The study was a retrospective, descriptive, cross-sectional study of antihypertensive medicines prescriptions for adult outpatients from 18 years of age. We assessed the names of the antihypertensive medicines, patients' sex, patients' age, number of prescriptions per encounter, drugs prescribed by generic names, number of drugs on essential drug list; using standardized approach (21) recommended to investigate the pattern of drug prescriptions. We also assessed the prescribers' compliance with the hypertension treatment guidelines.

Sample Size of the Study

A total enumeration approach was adopted rather than probability sampling since no a priori sample-size calculation was applicable, the sample size comprised all the available prescriptions in the data source within the study period (311 prescriptions) of which 280 met the inclusion criteria.

Method of Data Collection

The prescriptions containing anti-hypertensive medicines for hypertensive patients were collected from the data source of the hospital pharmacy department during the study period and were analyzed. Information gathered from the prescription was used to complete data collection questionnaires. Each of the questionnaires used, contained three sections (Sections A, B and C). Data regarding the patient age, sex, were collected in section A, while drug name, date of prescription, number of drugs per prescription, drugs prescribed by generic names, number of drugs prescribed from essential drug list were collected in section B; and data regarding the name of prescribed anti-hypertensive medicine, class of drug, formulation of drug prescribed, were collected in section C.

We included all anti-hypertensive medication prescriptions for confirmed diagnosis of hypertension for patients from 18 to 65 years of age, and excluded prescriptions for inpatients or emergency departments and those from other hospitals.

Ethical Consideration

Ethical clearance was sought and a formal letter was written to the Enugu State University Teaching Hospital ethical clearance committee, with the attachment of the research proposal. An approval to conduct the study was obtained from the hospital management (ESUT/HREC/2025/04/043) dated 30th April 2025.

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Patients consent was not required by the ethical committee of the hospital due to anonymized data and the retrospective nature of the study.

Statistical Analysis

Data were entered into and analyzed using SPSS software version 23.0 for windows. Descriptive statistics including frequency and percentages were used for; describing socio-demographic characteristics, distribution of therapies used, patients whose BP was controlled, identified drug related problems in controlled and uncontrolled BP. Independent sample t-test was used to determine the effect of identified drug related problems on the patients BP control. A p value < 0.05 was regarded as statistically significant with 95% confidence interval to test the level of significance.

RESULTS

Patients Demographics

Out of 311 prescription papers assessed, 280 (90.03%) met the study criteria and were included for the study. Majority of the assessed prescriptions were females (61.79%). Patients between the ages of 60 and 69 years old were highest in number (29.29%) while patients less than 39 years were the least in number (5.71%). Diabetes Mellitus took up to slightly more than half (50.51%) of all the chronic conditions that contributed to co-morbid conditions with hypertension (Table 1).

Prescription pattern considering WHO core indicators

A total of 280 prescriptions for hypertension were assessed with 669 as the total number of prescribed anti-hypertensive medicines. The average number of drugs per encounter was 2.39 while 88.04% were prescribed by generic name. (Table 2).

Distribution of anti-hypertensive therapy used for treatment of hypertension

Bitherapy was the most common therapy used for the management of hypertension in the hospital (45.36%), followed by tritherapy (36.43%), while monotherapy (10.36%) and quadritherapy (7.85%) was the least common used form of therapy. (Table 3).

Blood pressure was controlled in twenty-one (21) patients placed on monotherapy, with Calcium Channel Blockers (CCB) (33.33%) and Thiazide diuretics (THZ) (33.33%) (Table 4). Among the patients placed on combination therapy, the blood pressure was controlled in one hundred and three (103) patients and other combinations of antihypertensives without CCB, THZ, ACEIs accounted for 41.76% (Table 4).

Table 1: Baseline characteristics of the respondents

	Variables	Frequency (%)
Gender	Male	107 (38.21)
	Female	173 (61.79)
Age	≤ 39	16 (5.71)
	40 - 49	63 (22.50)
	50 – 59	65 (23.21)
	60 – 69	82 (29.29)
	70 and above	54 (19.28)

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Comorbid Condition	Diabetes Mellitus	49 (50.51)
	Heart Failure	14 (14.43)
	Dyslipidemia	13 (13.40)
	Peptic Ulcer disease	05 (5.16)
	Others	16 (16.50)

Note : % - Percentage

Table 2: Adherence of prescription pattern to the WHO core indicators

Assessed prescribing indicator	Total number of encounters	Average	Reference value
Total number of assessed Prescriptions	280		
Total number of prescribed Antihypertensive medicine	669		
Average number of drugs per Encounter		2.39	1.6 – 1.8
Drugs prescribed by generic name	589	88.04	100

Table 3: Overall distribution of therapies used for the treatment

Therapy	N (%)
Monotherapy	29 (10.36)
Bitherapy	127 (45.36)
Tritherapy	102 (36.43)
Quadritherapy	22 (07.85)
TOTAL	**280 (100.00)**

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Table 4: Distribution of patients whose BP was controlled according to antihypertensive regimen prescribed

Therapy medications	Number of patients (%)
Monotherapy	
ACEI	05 (23.82)
CCB	07 (33.33)
THZ	07 (33.33)
BB	02 (09.52)
TOTAL	**21 (100.00)**
Combination therapy	
CCB/THZ	14 (14.00)
CCB/THZ/ACEI	14 (14.00)
THZ/ACE	I15 (14.56)
CCB/ACE	I17 (16.50)
Others	43 (41.74)
TOTAL	**103 (100.00)**

CCB – Calcium Channel Blockers; ACEI – Angiotensin Converting Enzyme Inhibitors; THZ – Thiazide type diuretics; BB – Beta Blockers (Cardiovascular and Vasodilatoy only)

Drug Related Problems (DRP) with respect to blood pressure control

DRPs were identified in 106 (37.86%) patients and they included medication non-adherence, adverse drug reactions, dose too low, and unnecessary drug therapy (Table 5).

About 46 patients received unnecessary drug therapy while only 5 patients received doses of their medication that are too low. A statistical difference with p-value < 0.001 was observed in the controlled versus uncontrolled blood pressure for patients that experienced adverse drug reactions (Table 5).

Antihypertensive therapy on blood pressure control among the hypertensive patients.

The monotherapy that included calcium channel blockers, thiazide type diuretics, and angiotensin converting enzyme inhibitors were assessed for mean value of SBP reduction and DBP reduction. Calcium channel blockers had highest SBP and DBP mean value reductions of 31.14 mmHg and 16.00

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mmHg, respectively (Table 6). In the prescribed combination therapies, CCB + THZ + ACEI showed the highest SBP and DBP mean value reductions of 30.22 mmHg and 17.62 mmHg respectively (Table 6).

Table 5: Identified types of Drug Related Problems (DRPs) with respect to the level of BP control

	Medication Non-adherence	**ADRs**	**Dose too low**	**Unnecessary drug therapy**	**TOTAL**
	N(%)	**N(%)**	**N(%)**	**N(%)**	**N (%)**
Controlled	07 (38.89)	21 (63.64)	04 (44.44)	14 (77.78)	46 (43.40)
Uncontrolled	11 (61.11)	12 (36.36)	05 (55.56)	32 (22.22)	60 (56.60)
TOTAL	18 (100%)	33 (100%)	09 (100%)	46 (100%)	**106 (100%)**
P-value	0.422	**< 0.001**	0.511	0.644	

Notes: BP - Blood Pressure; ADRs - Adverse Drug Reactions; N - Number; % - Percentage

Table 6: Comparison of the effect of anti-hypertensive class combinations on the reduction of SBP/DBP of the patients.

Antihypertensive class combinations	**SBP reduction (mmHg)**	**DBP reduction (mmHg)**
CCB (n – 7)	31.14	16.00
THZ (n – 7)	20.14	13.71
ACEI (n -5)	14.80	12.60
BB (n - 2)	11.20	08.50
CCB + THZ (n – 14)	27.09	15.60
THZ + ACEI (n – 15)	15.02	14.26
CCB + ACEI (n – 17)	23.82	13.84
CCB + THZ + ACEI (n – 14)	30.22	17.62
Others (n - 43)	17.68	12.22

Notes: SBP – Systolic Blood Pressure; DBP – Diastolic Blood Pressure; n - number of patients.

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DISCUSSION AND CONCLUSION

Discussion

Rational drug prescription is essential for outcome of drug therapy and in our study, females (61.79%) seem more affected with hypertension than men (38.2%). Studies show more prevalence of hypertension in the females, especially the aging women compared to males (11). Our study also show increased number of patients with age till the age bracket of 60 and 69 years, then less number of patients from 70 years old. The result is consistent with studies which show that hypertension increases with age and the need to access healthcare also increases with age (9, 15). Some factors can be considered for the less number of patients from 70 years of age and they may include; number of patients that are alive in the age bracket compared to the younger ones, incompetence to access health care due to out-of- pocket payments in the region and due to other health complications. The health care providers not making up to 100% prescription of the antihypertensive medications may be lack of trust on the quality of some brands of antihypertensives in the market, whereas the average number of greater than two antihypertensives prescriptions per patient is in line with the hypertension treatment guideline in cases where blood pressure could not be controlled with one antihypertensive medication (22, 23).

It was observed that in the patients that experienced blood pressure control, monotherapy was least prescribed mostly with Calcium channel blockers and thiazide-type diuretics which may be as a result that many hypertensive patients do not get to blood pressure goal with the use of one agent, while in the combination therapy on the other hand, the prescriptions were mostly calcium channel blockers- based and Thiazide -type diuretic-based. The use of the medications and the outcome is consistent with the evidence-based studies in part of treatment guidelines that support use of CCBs and thiazide type diuretics in hypertension management among black population.

The reason for more number of patients that reported adverse adverse effects experiencing BP control than those that experience uncontrolled BP may not be fully explained, but several factors may contribute to the event and they can include; patients willingness to be treated and the extent of the reported adverse effects.

Conclusion

Majority of the healthcare providers adhered to the hypertension treatment guidelines but the average number of prescription per encounter with the patients was 2.39 and percentage of drugs prescribed by generic name was 88.04. Patients experienced adverse drug reactions more than any other identified drug related problems. Calcium Channel Blockers, Thiazide-type diuretics and their combination-based were more effective in reducing both the systolic blood pressure and diastolic blood pressure compared to other agents.

Limitation of the Study

Although the research was diligently done, there were few limitations. First, we used a single institution due to insufficient fund. We considered that the institution is a teaching hospital and in our view, it has the capacity in terms of human resources and funding required in the management of hypertensive patients in the country. On that note, we assume that the information obtained from the institution provides a reasonable indicator for drug prescriptions. This may not represent what is obtainable in other institutions. Second, we could not interview the healthcare providers due to convenience and time constraint in other to understand the rationale behind the prescriptions.

Recommendation

i. We recommend that all the healthcare providers that manage hypertensive patients should have

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continuous training in other to obtain up to date knowledge with the practice guidelines.

ii. We recommend increased patients knowledge and awareness of hypertension through education intervention.

Suggestions for further studies

Further investigations can be done on:

i. intervention program for healthcare provides on rational use of antihypertensive medicines for treatment of hypertension.

ii. multi-center institutions to note and compare their prescription patterns of antihypertensive medicine; and the treatment outcomes.

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