

Audit of anti-hypertensive medication prescription in Nigeria: a comparison of two tertiary hospitals

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Abstract

Background: Guidelines exist streamlining the drug management of hypertension. We compared conformity of anti-hypertensive medication prescriptions to internationally acceptable guidelines at two tertiary hospitals in Nigeria.

Methods: Antihypertensive prescriptions in consecutive patients with hypertension attending medical outpatient clinics at the Jos University Teaching Hospital (JUTH), Jos and the Federal Medical Centre (FMC), Makurdi were audited. Also evaluated among these patients were medication adherence and blood pressure control.

Results: Appropriate prescriptions were present in 80.6% of the patients [89 (90.8%) JUTH patients and 86 (72.3%) FMC patients respectively; $p = 0.0005$]. The median number of drugs was two. Diuretics were the commonest drugs used (82.4% JUTH patients and 74.8% FMC patients; $p = 0.18$). Angiotensin converting enzyme inhibitors (ACEIs) were the second most commonly used medication (60.2% of JUTH and 52.9% of FMC patients respectively $p = 0.28$). The

calcium channel blockers were used by 55.1% of JUTH 45.4% of FMC patients respectively ($p = 0.15$). Good medication adherence was present in 83 (84.7%) of JUTH and 78 (65.5%) of FMC patients; $p = 0.001$. BP control in the JUTH and FMC cohorts was 42.9% and 32.8% respectively; $p = 0.12$. On the whole, BP control was better among patients with good adherence compared to those without (41.6% vs. 25% respectively; $p = 0.02$).

Conclusion: Anti-hypertensive prescriptions in this study conform to internationally acceptable guidelines. Diuretics and ACEIs are the most commonly used drugs. Renoprotection is however suboptimal in patients with DM.

Keywords: Audit; Antihypertensive; Compelling Indications; Medications

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Introduction

Hypertension is the most common cardiovascular disease risk factor. It afflicts over 972 million persons worldwide¹. Recent surveys suggest that it has a prevalence of 25% in Nigeria²⁻⁶ where it causes significant morbidity and mortality from renal failure, stroke and heart failure⁷⁻¹⁰. Fundamental to the prevention of the complications of hypertension is its control. However, achieving adequate blood pressure (BP) control is adjudged to be poor all over the world. A large proportion of patients on treatment for hypertension in the western world have poor BP control¹¹⁻¹³. Available literature indicates that less than 40% of Nigerians on medications for hypertension have good BP control¹⁴⁻¹⁶.

Treating hypertension can be complex and challenging as the disease has a varied aetiology and polymorphisms. Caring for patients with hypertension is even more demanding given the co-morbidities and complications associated with the disease and the wide range of medications touted by the pharmaceutical companies. To streamline the management of hypertension, numerous clinical practice guidelines have evolved over the years¹⁷⁻¹⁹. We conducted a cross sectional study of patients with hypertension seen at two tertiary hospitals in north central Nigeria to describe conformity of anti-hypertensive medication prescriptions with internationally acceptable guidelines. We also sought to find out about anti-hypertensive medication adherence and BP control in these patients.

Materials and Methods

Study design and setting

This was a cross sectional study of patients with hypertension seen at the Jos university teaching hospital (JUTH) in Plateau state and at the Federal Medical Centre, Makurdi in Benue state. The study lasted for a period of twelve weeks. JUTH is 520 bed tertiary hospital accredited for residency training in Internal Medicine located in Jos, the capital of Plateau

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state while the FMC is a 400 hundred tertiary hospital located in Makurdi, the capital of Benue state. The two hospitals are located approximately 330 kilometres apart, both in the north central Nigeria. They serve as referral centres for the surrounding states.

Subjects

Adult hypertensive patients enrolled at the medical outpatient clinics of these two hospitals and had been on follow-up for at least a year was recruited for the study. The convenient patient sampling method was used where consecutive subjects satisfying the inclusion criteria (age ≥ 18 years and regular follow up at the clinic for at least a year) were enrolled. All newly diagnosed hypertensive patients and those not regular on follow up were excluded from the study.

Data collection

A pilot test was carried out among 10 patients attending the clinics in each centre after which modifications to the data collection tool were made as appropriate. All subjects were interviewed and information regarding demography and duration of hypertension recorded. Additional information obtained from the subjects included whether they missed taking their drugs and the number of times drugs were missed in a week. Data regarding drug treatment of hypertension was retrieved from the patients' folders. Other information extracted from the folders included previous diagnosis of diabetes mellitus (DM), heart failure (HF), coronary artery disease (CAD), stroke, peripheral vascular disease and chronic kidney disease (CKD). Adherence to anti-hypertensive medication was assessed using the modified Morisky-Green tool²⁰. This is an eight item questionnaire used to assess medication adherence among hypertensive patients. Response categories are "yes" or "no" for the first seven questions and a three- point Likert response for the eighth question. A "No" answer for the first seven questions scores one point each, and a "yes" answer is scored zero. For the eighth question, "all of the time" is scored zero, "some of the time" one and "never" a score of two.

BP was measured on the right arm with the patients seated and the arm resting on a table at the level of the heart after five minutes of rest. The average of this BP recording and the measurements at the last two clinic visits was taken as the BP control. All the subjects fasting blood glucose (FBG) and serum creatinine determined. The estimated the glomerular filtration rate (eGFR) was determined from the serum creatinine using the Cockcroft-Gault equation²¹ which had previously been verified in our practice²².

Definition of terms

A prescription was considered appropriate if anti-

hypertensive medication prescription conformed to internationally acceptable guidelines in the setting of compelling indications. Adherence to medication was regarded as good if patients scored six and above on the Morisky scale. DM and CKD were defined according to standard guidelines. Good BP control was taken as an average BP of less than 140/90 mmHg (130/80 mmHg if patient has DM or CKD)¹⁷.

Outcome measures

The primary outcome measure was conformity of anti-hypertensive medication prescriptions with internationally acceptable guidelines and the secondary outcome measures included: 1) medication adherence and 2) BP control.

Ethical considerations

The study was part of a larger study approved by the Ethics Committee of FMC, Makurdi evaluating hypertensive patients. Informed consent was obtained from the participants. Data obtained was stored in Windows Excel and released only when required for analysis. Responses by the subjects were kept anonymous and all patient identifiers removed.

Statistical methods

Data was analysed using Epi info 2008 version 3.5.1 (CDC, Atlanta, GA). Discrete variables were expressed as proportions while uniformly distributed continuous variables were expressed as means \pm SD. Non-uniformly distributed continuous variables (like duration of hypertension and number of anti-hypertensive agents) were expressed as median with ranges. The Chi-Squared test was used to compare proportions. When cells contained less than five observations, the Fisher Exact test was used to compare proportions. The Student's "t" test was used to compare group means. The duration of hypertension was not uniformly distributed, hence the non-parametric test, Kruskal-Wallis was used to compare the duration of hypertension between the JUTH and FMC cohorts. P values < 0.05 were considered significant.

Results

A total of 217 patients with hypertension (39 males and 59 females from JUTH; 46 males and 73 females from FMC) were studied. Table 1 shows the characteristics of the patients. The mean age of the patients from JUTH was 56 ± 14 years while that of the patients from FMC was 55 ± 10 years, $p = 0.45$. The median duration of hypertension was similar within these groups of patients (eight years for JUTH; range of one to 37 years and six years for FMC; range of one to 39 years). Only seven (3.5%) patients smoked cigarettes.

Table 1. Characteristics of 217 patients with hypertension in two tertiary hospitals in north central Nigeria

Characteristics	JUTH N = 98	FMC N = 119	P value
Sex (M/F)	39/59	46/73	0.86
Age, years	56±14	55±10	0.45
Duration of hypertension, years, median with range	8 (1-37)	6 (1-39)	0.08
Diabetes mellitus, N (%)	22 (22.4)	49 (41.2)	0.003
Heart failure, N (%)	-	8 (6.7)	-
CKD, N (%)	39 (39.8)	56 (47.1)	0.28
Stroke, N (%)	2 (2)	19 (16.0)	< 0.0001
Compelling indications, N (%)	54 (55.1)	95 (79.8)	< 0.0001
SBP	137±24	146±23	0.004
DBP	84±13	86±13	0.12
SCR, µmol/L, median with range	98 (45-1000)	110 (56-262)	0.69
eGFR, ml/min/1.73m ²	68.2±36.7	67±26.0	0.88

JUTH: Jos University Teaching Hospital; FMC: Federal Medical Centre, Makurdi

Compelling indications for treatment of hypertension

A total of 149 patients (68.7%) had compelling indications for antihypertensive therapy. Twenty two (22.4%) of the patients from JUTH and 49 (41.2%) of the FMC patients had co-existing DM ($p = 0.003$). CKD was present in 39 (39.8%) of JUTH patients and 56 (47.1%) of the FMC patients respectively; $p = 0.28$). Previous stroke was present in two (2.2%) of JUTH patients and 19 (16.0%) of FMC patients respectively; $p < 0.0001$. Heart failure was present in eight FMC patients and in none of the JUTH patients. More FMC patients had compelling indications compared to JUTH patients [95 (79.8%) vs. 54 (55.1%) respectively; $p < 0.0001$]

Anti-hypertensive therapy

All the JUTH patients and all but five of the FMC patients were on anti-hypertensive medications. The five FMC patients that were not on treatment had compelling indications for drug treatment. On the whole, appropriate prescriptions was present in 175 (80.6%) of the patients. Eighty nine (90.8%) JUTH patients and 86 (72.3%) FMC patients had appropriate prescriptions respectively; $p = 0.0005$. The median number of drugs was two for both patient groups with ranges of 1-5. Table 2 shows that on the overall, diuretics were the commonest anti-hypertensives prescribed being used by 79 (82.4%) JUTH patients and 89 (74.8%) FMC patients ($p = 0.18$). Angiotensin converting enzyme inhibitors (ACEIs) were the second most commonly used anti-hypertensive medication [59 (60.2%) of JUTH and 63 (52.9%) of FMC patients respectively ($p = 0.28$)]. The calcium channel blockers (CCB) were used by 54 (55.1%) JUTH patients and 54 (45.4%) FMC patients respectively ($p = 0.15$). Other anti-hypertensive agents prescribed for these patients

included Angiotensin II receptor blockers (ARB) and centrally acting drugs. The α -receptor blockers and directly acting vasodilators were not being used by any patient.

Table 2. Anti-hypertensive prescriptions among patients in two tertiary hospitals in north central Nigeria

Antihypertensive agents and modality	JUTH, Jos	FMC, Makurdi	P value
Drugs used			
ARBs	10 (10.2)	9 (7.6)	0.49
ACEIs	59 (60.2)	63 (52.9)	0.28
BB	19 (19.4)	31 (26.1)	0.24
CCBs	54 (55.1)	54 (45.4)	0.18
Centrally acting	12 (12.2)	11 (9.2)	0.47
Diuretics	79 (82.3)	89 (74.8)	0.18
Monotherapy, N (%)	17 (14.3)	19 (19.4)	0.31
Agents used as monotherapy, N (%)			
ARBs	0 (0.0)	3 (8.3)	-
ACEIs	6 (16.6)	7 (19.4)	0.25
BBs	0 (0.0)	2 (5.5)	-
CCBs	3 (8.3)	3 (8.3)	1.0
Diuretics	9 (25)	3 (8.3)	0.03
No of Drug combinations			
2	41 (41.8)	59 (49.6)	0.23
3	26 (26.5)	34 (28.6)	0.76
4	7 (7.10)	3 (2.5)	0.11
5	5 (5.1)	1 (0.8)	0.09
Appropriate prescription, N (%)	88 (89.8)	86 (72.3)	0.001
RAS blockade in CKD, N (%)	32 (82.1)	37 (66.1)	0.01
RAS blockade in DM, N (%)	17 (77.3)	37 (75.5)	0.33
Compliance, N (%)	83 (84.7)	78 (65.5)	0.001
Control, N (%)	42 (42.9)	39 (32.80)	0.12

JUTH: Jos University Teaching Hospital; FMC: Federal Medical Centre; ARB: Angiotensin II receptor blockers; ACEIs: Angiotensin converting enzyme inhibitors; CCB: Calcium Channel Blockers; CKD: Chronic Kidney Disease; DM: Diabetes Mellitus

A total of 36 patients [17 (14.3%) of the JUTH patients and 19 (19.4%) of the FMC patients] were on monotherapy; $p = 0.31$. The drugs used for monotherapy among the JUTH patients were diuretics in nine patients (25%), ACEIs in six (16.6%), and CCB in three patients (8.3%) while for the FMC patients ACEIs were used in seven patients (19.4%), diuretics in three (8.3%), CCB in three (8.3%), ARB in three (8.3%) and BB in two (5.5%). No JUTH patient was on BB monotherapy. Eighty one (82.7%) of the JUTH patients and 100 (84.0%) of FMC patients were on combination therapy ($p = 0.98$). Forty one (41.8%) of JUTH patients and 59 (49.6%) of FMC patients were on two drug combination (Table 2). Three drug combinations were used by 26 (26.5%) of JUTH and 34 (28.6%) of FMC patients respectively. The commonest drug combinations included ACEIs + Diuretic [18 JUTH patients (18.3%) vs. 21 FMC patients (17.6%)]; CCB + Diuretic [12 JUTH patients (12.2%) vs. 14 FMC patients (11.7%)] and ACEI + CCB + Diuretic [17 JUTH patients (17.3%) vs. 18 FMC patients (15.1%)] respectively.

Medication adherence and blood pressure control

On the whole, good medication adherence was present in 161 (74.2%) of the 217 patients studied; (83 (84.7%) of JUTH and 78 (65.5%) of FMC patients; $p = 0.001$). Medication adherence was similar between the monotherapy and combination therapy groups in JUTH and FMC patients [14 (73.7) vs. 69 (87.3%); $p = 0.13$ and 14 (82.4%) vs. 64 (62.7%); $p = 0.11$] respectively. Hypertension was controlled in 81 (37.3%) of the 217 patients studied. Hypertension control was similar between the JUTH and FMC cohorts [42 patients (42.9%) vs. 39 patients (32.8%) respectively; $p = 0.12$]. Among the JUTH patients, control of hypertension was better for monotherapy when compared with combination therapy (13 patients, 68.4% vs. 29 patients, 36.7%; $p = 0.01$). Similarly, hypertension was controlled in nine FMC patients (52.9%) on monotherapy compared to 30 patients (29.4%) on combination therapy ($p = 0.05$), indicating a small difference reaching the border of statistical significance.

On the whole, BP control was better among patients with good anti-hypertensive drug adherence compared to those without [67 (41.6%) vs. 14 (25%) respectively; $p = 0.02$]. When the relationship between medication adherence and BP control was explored in the two centres, there appeared to be no significant association between medication adherence and BP control [29 (37.2%) of medication adherent subjects had good BP control compared to 10 (24.4%) of the non-adherent ones in FMC; $p = 0.15$ vs. 38 (45.6%) compared to 4 (26.7%) in JUTH patients].

Discussion

Hypertension and its complications cause significant morbidity and mortality in both the developed and developing countries. Treatment guidelines exist streamlining its management. We conducted an audit of anti-hypertensive medication prescription in two tertiary health centres in a developing country in addition to assessing medication adherence and BP control. We demonstrated in this study that 1) there was a good conformity of anti-hypertensive medication prescription to internationally acceptable guidelines (more in the teaching hospital than the FMC) with the majority of patients being on combination therapy, 2) medication adherence is sub-optimal being more so in the FMC compared to the teaching hospital, and finally only a third of patients have adequately controlled BP. Furthermore, we found that on the overall, good medication adherence was associated with good BP control.

Our finding of conformed prescriptions to internationally acceptable guidelines in the presence of compelling indications and use of combination therapy in most patients in this study corroborates previous findings in Nigeria. Aminu and colleagues²³ working in north western Nigeria conducted a retrospective

analysis comparing a tertiary and secondary hospitals demonstrated appropriate prescriptions in 61.7% to 91.1% of patients with hypertension. This study by Aminu et al²³ showed that appropriate prescriptions were more in the teaching hospital compared to the secondary care facilities. Their study however differed from ours in that an appropriate prescription was defined "appropriate drug combinations" and did not take into consideration the presence of compelling indications. Similarly, Etuk and co-workers²⁴ demonstrated in a retrospective study of 145 patients that 80% of patients were on combination therapy with diuretic being used as the first line of treatment.

Diuretics followed by the CCBs were the commonest drugs prescribed while beta-blockers were sparingly used in our study. These findings are in keeping with previous reports^{23,24} and in compliance with national and international guidelines as diuretics and CCBs have been shown to be quite beneficial in the management of hypertension in blacks while the beta-blockers are said to be less beneficial. We note the absence of the directly acting vasodilators in our study as anti-hypertensive medications. This finding is also in keeping with previous reports and may be as a result of their absence from the Nigerian market (personal communication).

The use of renin-angiotensin aldosterone system (RAAS) blockade is suboptimal in patients with CKD; being more so at the FMC (82.1% vs. 66.1% respectively, $p = 0.01$). Similarly, RAAS blockade in patients with DM, a ready cause of CKD, is suboptimal in this study. RAAS blockade is the mainstay of CKD management as this has been shown to delay and/ or halt the progression of CKD to end stage renal disease (ESRD)²⁵⁻²⁷. Current guidelines emphasize the need for RAAS blockade centred anti-hypertensive regimes in patients with DM and also CKD in a bid to prevent ESRD¹⁷⁻¹⁹.

Adherence to anti-hypertensive medication was suboptimal in our patients (84.7% and 65.5% among the JUTH and FMC cohorts respectively). Similar rates of adherence have previously been reported in Nigeria. Okeahialam²⁸ recently reported a medication adherence rate of 67.6% in Jos, Nigeria. Adherence in these studies was assessed by simple recall except in our study where adherence in some of the patients was assessed by the Morisky-Green tool²⁰.

Only a third of our patients had adequately controlled BP. This finding is in keeping with previous reports in Nigeria. Etuk and co-workers²⁴ reported that only 30.5% of patients in a tertiary hospital in north western Nigeria had adequate BP control. Similar rates have also been reported from south western^{14,15}. Katibi and colleagues¹⁶ working in Ilorin, north central Nigeria documented that only 35.7% of patients with hypertension treated at the teaching hospital had adequate BP control. Okeahialam²⁸ recently reported that 40% of patients seen in a private health facility in

Jos, north central Nigeria had adequate BP control.

Increasing patient compliance to medication has taken the centre stage in chronic diseases world over as it directly relates to patient outcome. Our study revealed that medication adherence was associated with good BP control. This stands to reason as the medications are meant to lower the BP. However, it is known that not all patients who adhere to medications have adequate BP control as some may have secondary hypertension that may be resistant to medications. This latter group of patients need further investigation to identify the cause of the hypertension and institute appropriate management. Our study was limited by the relatively small number of subjects although the number was comparable to previous studies in Nigeria. Furthermore, BP control was based on BP recordings taken at one point in time and home BP recordings (as ambulatory BP recording is not available in our practice) would have been more informative. We were unable to evaluate our patients for coronary artery disease hence its absence as a compelling indication in our patients. Despite the foregoing, our study had several strengths. We conducted a cross sectional study and thus we were able to interview our subjects unlike the previous studies that were largely retrospective in nature. Additionally, we assessed patients presenting at a teaching hospital and a non-teaching hospital in this study and as such we can extrapolate our findings to a large proportion of patients with hypertension as they are managed at such facilities. Another strength of our study was that we recruited patients who had been on regular follow up at the clinics for a minimum of one year in order to mirror clinical practice as it is known that patient fatigue may affect medication adherence and including newly diagnosed patients with hypertension may erroneously impact the assessed medication adherence. Our study results show gaps in the therapeutics of hypertension by physicians and thus identify avenues for intervention.

In conclusion, our study describes antihypertensive prescriptions in two tertiary hospitals in a developing country. Anti-hypertensive prescriptions in this study conform to internationally acceptable guidelines with diuretics and ACEIs being the most commonly used drugs. Renoprotection is however suboptimal in patients with DM. The use of RAAS blockade in CKD patients needs to be emphasized. There is an inadequate BP control among patients with hypertension as a result of poor medication adherence. We recommend continued education of physicians and the domestication of guidelines to further streamline the management of hypertension. Physicians should play active roles in ensuring medication adherence among these patients.

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