

Prescribing pattern and medication use practices in a randomized control study among Hypertensive Patients attending University of Ilorin Teaching Hospital, Ilorin, Nigeria

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Abstract

The prevalence of hypertension is constantly on the increase. The increasing prevalence is attributed to population growth, aging and behavioral risk factors. This study was aimed to assess the pattern of prescribing and patients' use of antihypertensive medication. The study was carried out among hypertensive patients attending the cardiology unit of University of Ilorin Teaching Hospital, Ilorin, Kwara State, Nigeria. The study design was a prospective randomized control study with consecutive patients' selection randomized into control and intervention groups. The total number of patients that were enrolled into the study was 317 which was randomized into control (158; 49.8%) and intervention (159; 50.2%) groups. The mean age of the patients was 59.5 ± 20.5 years with the control group having 58.7 ± 13.3 and the intervention group 59.7 ± 12.9 ($p = .472$). The mean systolic blood pressure in the control and intervention groups were found to be 139.4 ± 21.4 and 143.3 ± 23 respectively while the diastolic blood pressure was 87.1 ± 14.9 mmHg and 89.5 ± 14.3 . The number of patients with comorbid conditions were 125 (39.4%) with heart failure being the most occurring (47; 14.8%) and the least were goitre and asthma (2; 0.6% each respectively) and 21 (7.6%), had more than one comorbid condition. The calcium channel blocker/Angiotensin receptor blocker/diuretics combination was the most widely prescribed. The intervention group significantly improved in hypertensive drugs identification ($p = 0.018$) and patients' attitudes in refilling prescriptions ($p = 0.020$) in the intervention group compared to control group. The prescription pattern of antihypertensive drugs was good and intervention provided improvement in their medication use practice.

Key words: prescribing, pattern, antihypertensive, comorbid, hypertension

INTRODUCTION

Cardiovascular diseases (CVDs) are the leading causes of death worldwide with about 17 million deaths a year.¹ Hypertension (HTN) is the most important risk factor for CVDs and the leading cause of disability and death in

both developing and developed countries.^{2,3} Of these deaths, complications from hypertension account for 9.4 million deaths every year.¹ Many interrelated factors are known to be associated with elevated pressure which are genetic, renin-angiotensin-aldosterone system and autonomic

nervous system, cardiac output and peripheral resistance insulin insensitivity, hypercoagulability, endothelial dysfunction, vasoactive substances which independently or in association with one another contribute to raised blood pressure and when sustained lead to established hypertension.⁴ The prevalence of hypertension dramatically increases in patients older than 60 years. In many countries, up to 50% of individuals in this age group have hypertension.¹ The increasing prevalence of hypertension is attributed to population growth, ageing and behavioral risk factors, such as unhealthy diet, harmful use of alcohol, lack of physical activity, excess weight and exposure to persistent stress.⁵ The WHO Global Status Report on non-communicable diseases listed Nigeria and other developing countries as the worst hit with deaths from non-communicable diseases (WHO, 2014) and with the rising burden of cardiovascular diseases and risk factors including hypertension as the most prevalent of them.⁶ Over 80% of cardiovascular and diabetes deaths occur in low- and middle-income countries. Behavioral risk factors, including tobacco use, physical inactivity, and unhealthy diet, are responsible for about 80% of coronary heart disease and cerebrovascular disease.⁵ Evidence from high-income countries has shown that with comprehensive focus on prevention and improved treatment following cardiovascular events there has been dramatic declines in mortality rates in cardiovascular diseases. A combination of population-wide and individual interventions can reproduce successes in many more countries

through cost-effective initiatives that strengthen overall health systems.⁷

Anti-hypertensive medicines should be instituted for patients whose blood pressure cannot be controlled with lifestyle and dietary modification only even if the patient is in the pre-hypertensive stage.^{8,9} First-line medications used in the treatment of hypertension include diuretics, angiotensin-converting enzyme (ACE) inhibitors or angiotensin receptor blockers (ARBs), beta-blockers, and calcium channel blockers (CCBs). Some patients will require two or more antihypertensive medications to achieve their BP target. In newly diagnosed patients with BP >20/10 mm Hg above goal, antihypertensive or a combination of anti-hypertensive may be added immediately. To minimize side effects, a second drug with a complementary mechanism of action should be added before the initial drug is used in the maximum recommended dosing. There is evidence to support initiating drug treatment with an angiotensin-converting enzyme inhibitor, angiotensin receptor blocker, calcium channel blocker or thiazide-type diuretic in the nonblack hypertensive population, including those with diabetes. In the black hypertensive population, including those with diabetes, a calcium channel blocker or thiazide-type diuretic is recommended as initial therapy. There is moderate evidence to support initial or add-on antihypertensive therapy with an angiotensin-converting enzyme inhibitor or angiotensin receptor blocker in persons with CKD to improve kidney outcomes.¹⁰ Although, this guideline provides evidence-based

recommendations for the management of high BP and should meet the clinical needs of most patients. These recommendations are not a substitute for clinical judgment, and care decisions must carefully consider and incorporate the clinical characteristics with the circumstances of each patient.¹⁰ The key to successful treatment of hypertensive patients are patient motivation, minimal side effects, simplicity of regimens and medication efficacy. The first three are important in achieving compliance and involve the physician and his associate staff as well as the patient. Minimizing side effects is one of the major goals in the pharmacologic control of high blood pressure. Most investigators with experience using the vasodilatory β -blocker combination are impressed with its relative lack of side effects.¹¹ Types of antihypertensive medications include the following;

Diuretics: Diuretics can be divided into 3 groups—thiazides, loop, and potassium-sparing diuretics. Thiazide diuretics act by inhibiting the absorption of sodium and chloride in the distal convoluted tubule. The benefits of thiazides for stroke, heart failure, and coronary artery disease (CAD) outcomes have been well-established in trials, such as the Veterans Affairs (VA) Cooperative Studies in the 1960s, Systolic Hypertension in the Elderly Program (SHEP) in the 1980s, and the Antihypertensive and Lipid-Lowering Treatment to Prevent Heart Attack Trial (ALLHAT) in the 1990s. Based on the ALLHAT results showing thiazides' superiority to other classes of antihypertensive drugs in terms of secondary endpoints and costs, the JNC-7 issued its recommendations for

thiazides as first-line therapy for hypertension. Loop diuretics act on the thick ascending loop of Henle, where they selectively inhibit the luminal $\text{Na}^+/\text{K}^+/\text{2Cl}^-$ symporter thereby reducing NaCl reabsorption. Loop diuretics are highly efficacious in that they target a segment of the nephron with great re-absorptive capacity. These agents can be used alone or in combination for the management of hypertension. Although thiazides are the preferred class of diuretics, loop diuretics may be preferred in patients with congestive heart failure, acute pulmonary edema, or renal disease. Loop diuretics are relatively inexpensive and are available in generic forms.¹² Potassium-sparing diuretics act on the distal and cortical collecting tubules to decrease sodium reabsorption by either blocking aldosterone receptors (spironolactone, eplerenone) or by inhibiting Na^+ influx through epithelium sodium ion channels in the apical membrane of the collecting tubule (amiloride and triamterene). These are mild diuretics and are effective in the treatment of hypertension, but are seldom used alone. These agents are recommended as adjunct therapy in the treatment of hypertension, especially when their hyperkalemic effect is desired. Through their actions on aldosterone receptors, spironolactone and eplerenone have been shown to reduce morbidity and mortality in patients with heart failure. Caution must be exercised when these agents are used in conjunction with an ACE inhibitor or ARB because clinically significant hyperkalemia can occur.

ACE inhibitors. Angiotensin Converting Enzymes inhibitors exert their BP-

lowering effects by inhibiting the conversion of inactive angiotensin I to active angiotensin II. In addition, bradykinins and subsequently prostaglandins are increased, which contributes to ACE inhibitor BP-lowering effects. The JNC-7 endorses the use of ACE inhibitors when any of the following compelling indications exist: heart failure, post-myocardial infarction, high-risk of CAD, diabetes, chronic kidney disease and/or stroke.

Angiotensin receptor blockers (ARBs): ARBs block angiotensin II from binding to its receptor, thereby preventing it from causing vasoconstriction and fluid retention. Telmisartan alone and in Combination with Ramipril in a Global Endpoint Trial (ONTARGET) established that the ARB, telmisartan, is not inferior to the ACE inhibitor in reducing CV and renal events in high-risk patients without heart failure (Abraham et al., 2015). A similar effect is seen with other ARBs and was confirmed in a recent Cochrane search, showing comparable BP-lowering effects between ARBs and ACE inhibitors.¹³

Renin inhibitors: Aliskiren is the first agent in a new class of antihypertensive drugs that inhibits the conversion of angiotensinogen to angiotensin I via renin inhibition. It is approved for monotherapy as well as in combination with other antihypertensive medicines. One study has shown that aliskiren is not inferior to other antihypertensive agents and is significantly superior to ramipril in reducing mean systolic BP. Aliskiren may have renoprotective effects, reducing the mean urinary albumin to creatinine ratio by 20% in patients with

type 2 diabetes. However, because of cost concerns and robust clinical outcomes of ACE inhibitors and ARBs, aliskiren is currently recommended as a second-line agent.¹⁴

Calcium channel blockers. CCBs lower BP by preventing the entry of calcium into vascular smooth muscles, resulting in vasodilation and reduced vascular contractility. The 2 types of CCBs are; dihydropyridines which act on peripheral blood vessels and non-dihydropyridines, which act on cardiac muscles and peripheral blood vessels. Randomized controlled trials have demonstrated that dihydropyridines are effective at reducing CV events, mortality and strokes, particularly in the elderly. Non-dihydropyridines are useful in the treatment of cardiac arrhythmias. Both types of drugs are effective as monotherapy in reducing BP and are generally well tolerated. Recent results from the ACCOMPLISH trial have shown that CCBs are comparable first-line agents and are well tolerated when combined with another drug, especially an ACE inhibitor. The JNC-7 recognizes CCBs as a possible first-line drug class for patients at high risk for CVD or those with diabetes.¹⁵

Beta-blockers: Beta-blockers lower BP primarily by blocking beta-1 adrenergic receptors resulting in slower heart rate, decreased cardiac contractility and reduced cardiac output. As a result, beta-blockers are considered first-line medications in patients with acute MI. Beta-blockers also inhibit renin release and subsequently angiotensin II production and are therefore useful in the treatment of hypertensive patients with

congestive heart failure and/or with asymptomatic left ventricular hypertrophy (LVH). Clinical differences to consider when selecting an individual beta-blocker are beta-receptor selectivity and intrinsic sympathomimetic activity (ISA). Beta-blockers (for example (e.g.), atenolol, bisoprolol, and metoprolol) with a greater affinity to beta-1 receptors (heart) than beta-2 receptors (lungs, kidneys, and vasculature) are considered cardio-selective. Nonselective beta-blockers have affinity to beta-1 and beta-2 receptors and may not be the preferred agents when treating a CV indication. Some beta-blockers (That is; labetalol, carvedilol) also have an alpha receptor-blocking component, thus increasing its BP-lowering capabilities. Beta-blockers with ISA (i.e., pindolol) have some stimulatory effects on the receptors they block but are less than a pure agonist. These agents are preferred when bradycardia is a concern. In the absence of acute MI, congestive heart failure and asymptomatic LVH, most experts agree that beta-blockers should not be used as first-line treatment in patients with essential hypertension.¹⁴

Alpha-blockers. Alpha-blockers lower BP by blocking vasoconstricting alpha-1 adrenoreceptors on vascular smooth muscles. They are beneficial in hypertensive men with benign prostate hypertrophy; otherwise, they are not recommended for initial monotherapy. In ALLHAT, doxazosin was associated with an increased risk for CV events compared with chlorthalidone.

Direct vasodilators. Hydralazine and minoxidil are two common agents in this class. Both directly relax vascular smooth

muscle, primarily arterioles, through different mechanisms of action. Although both are effective antihypertensive medications, their side-effect profiles preclude their use as initial monotherapy agents or as first-line therapies and make them useful only as add-on therapy, especially in patients with severe hypertension or renal insufficiency. They are often prescribed in combination with a beta-blocker and a diuretic to negate side effects such as reflex tachycardia and fluid retention. Minoxidil is given once a day but diffuse hair/facial hair growth (hirsutism) minimizes its use in women. Hydralazine is effective in the treatment of hypertensive emergencies. A severe but less frequent adverse event that may potentially occur with chronic hydralazine use is drug-induced systemic lupus erythematosus which is reversible with discontinuation of the medication.

Combination therapy: This is beneficial and should be initiated when BP is more than 20/10 mm Hg above goal. Most combination therapies utilize antihypertensive agents that act by different but complementary mechanisms to maximize BP-lowering effects. Advantages of fixed combination therapy include better compliance, fewer side effects, faster response and possibly lower cost, depending on the choice of agents and the insurance programs. The combination of an ACE inhibitor or ARB with a diuretic is an effective and well-tolerated initial regimen. The ACCOMPLISH trial has demonstrated that the combination of a CCB plus an ACE inhibitor is also very effective. Concurrent use of an ACE inhibitor and an ARB is not a preferred combination.

Although rarely used in heart failure or in diabetes patients with significant proteinuria. In ONTARGET, patients receiving a combination of an ACE inhibitor and an ARB had a significantly greater risk of hypotension, syncope, renal dysfunction and hyperkalemia.¹⁶ Other less-effective combinations include beta-blockers/ACE inhibitors, beta-blockers/alpha-blockers or agonists and beta-blockers/non-dihydropyridines.¹⁷ Eplerenone is an alternative aldosterone antagonist if adverse events are experienced with spironolactone. Failure of a 4-drug regimen may require referral to a hypertension specialist. Less favourable options before referral include centrally acting alpha-agonists (clonidine and methyl dopa) or vasodilators (hydralazine and minoxidil).

Among hypertensive patients, the success of hypertension management is usually associated with rational prescribing of antihypertensive drugs and attitudes of the patients in medication use. Hence, this study was to assess the prescribing pattern of antihypertensive medicine and patients' practice of antihypertensive medication.

RESEARCH METHODS

Ethical consideration

Ethical approval for the conduct of the research was obtained from the University of Ilorin Teaching Hospital Ethical Review Committee (UITH-HRC) with reference number ERC/PAN/2020/02/0002. Informed consents were sought from the patients before enrolment into the study.

Study site

Ilorin is the capital city of Kwara state in North-Central Nigeria. It is a linked settlement between North and South Western Nigeria. It is located in the North Central geopolitical zone on Latitude: 8° 29' 47.90" N Longitude: 4° 32' 31.70" E covering an area of 34,467.5 square kilometres. It is predominantly a Yoruba speaking community but other ethnic groups found are Nupe, Fulani and Baruba. Islam is the dominant religion in the area. As at 2006 census, it had a population of 777,667, making it the 7th largest city by population in Nigeria with a projection by 2021 of 970, 0000.¹⁸

The study was carried out at the University of Ilorin Teaching Hospital (UITH), a tertiary health facility located at Oke-Oyi, Ilorin East Local Government Head Quarters in Kwara State.

The research was conducted at the Cardiology Clinic of the Main Outpatient department (MOPD) of the hospital among hypertensive patients who were registered with, and attend the cardiology clinic of the hospital, and have been on antihypertensive medication for not less than 4 weeks.

Sample size determination

The sample size was determined according to recommended standards for sample size calculation in a randomized control study.¹⁹ The sample size determination was based on the ability to detect relevant differences in percentage change in the primary outcome which was the percentage change in blood pressure reduction (numerical variable) among hypertensive patients in the study.

The parallel random controlled design was to assess the effect of the intervention in the treatment group (intervention group) compared to the control group. The formula used for the calculation was as given as expressed by Thabane (2004) ²⁰ is given below:

$$n = \frac{[Z_{\alpha/2} - Z_{\beta}]^2 \times 2\sigma^2}{\delta^2}$$

The parameter definitions were: n=size per group; significance level (α) was set at 5% (0.05); expected SD = 10.17 mmHg; power (β) =0.9; Ratio of control to intervention =1; Z=1.96; margin = 4 and an estimated drop rate 30%. The allowable difference in the mean BP was assumed to be zero (0) and a difference in 5%(δ) change in SBP ²¹ was assumed to be clinically meaningful.

Online sample size calculator available at <http://riskcalc.org:3838/samplesize/> as contained in Wang and Ji. (2020)²² was used and the total sample size (N) obtained was 318 with 159 in each of the groups.

Study Design

Patients' recruitment was done on every clinic day which ran in two days of the week. Eligible patients were enrolled on a consecutive basis. The total number of patients assessed for eligibility within the period were 350. Patients in the control group were assigned odd numbers and those in the intervention group were assigned even numbers until a total of 318 patients were enrolled and randomized into control and intervention groups of 159 in each arm

This study design was a prospective longitudinal randomized interventional study which was carried out between March 2020 and May 2021 among hypertensive patients attending the Cardiology Clinic at the University of Ilorin Teaching Hospital. The design was in line with the CONSORT (Consolidated Standards of Reporting Trials) 2010 statement. ²³ This study design (Randomized Control Study) was chosen because it is less prone to bias and can more easily demonstrate the relationship between causes and effects. ²⁴ This was to enhance the strength of the research outcome through result comparison between pre-intervention and post intervention and also between control and intervention groups.

Data were collected on the day of enrollment, at 6 and 12 months on patients' knowledge of hypertension, patients' knowledge of lifestyle and dietary modification, the practice of lifestyle and dietary modification, blood pressure control and health-related quality of life. Patients were enrolled at baseline consecutively and randomized into control and intervention groups and studied simultaneously until the required number of participants (318) required for the study were recruited.

Data collection process

The data collection instrument used was a data collection form that was designed to evaluate the pattern of antihypertensive medication used among the patients. It also assessed the identification of medications, doses, frequency, regularity of use and

observing possible side effects from the medications

Data analysis

Data collected were extracted on an excel spreadsheet and properly sorted which were thereafter loaded in SPSS (Statistical Package for Social Sciences). Data were presented in frequency tables and percentages, and bar charts Chi square was used to determine association between categorical variables and p-value <0.05 was considered to be statistically significant.

RESULTS

The total number of patients that participated in the study was 317 which was randomized into control and intervention groups with a rejection of a patient's data from the control group due to incomplete data provided. One hundred and fifty eight (158; 49.8%) patients were in the control group while 159 (50.2%) were in the intervention group. There were 141 and 176 male and female participants respectively. The mean age of the patients was 59.5 ± 20.5 years with the control group having 58.7 ± 13.3 and the intervention group having 59.7 ± 12.9 ($p = .472$). The maximum and minimum ages of the patients were 85 and 22 respectively. The mean systolic blood pressure in the control and intervention groups were found to be 139.4 ± 21.4 and 143.3 ± 23 respectively while the diastolic blood pressure was 87.1 ± 14.9 mmHg and 89.5 ± 14.3 . The difference in both SBP and DBP were not statistically significant ($p = 0.124$ and 0.139 respectively). The maximum and minimum systolic BP values were 200 mmHg and 100 mmHg with diastolic

maximum and minimum values of 150 mmHg and 60 mmHg respectively.

Socio-demographic and health related characteristics of the patients showed that the baseline characteristics of the patients in the control and intervention groups were comparable with only a few patients' characteristics showing a significant difference ($p < .05$) in the distribution. Their characteristics were patients' marital status ($p = .033$), presence of a family history of hypertension ($p = .027$) and presence of adverse drug reaction ($p = .024$) (Tables 4.1 and 4.2). The majority of the patients were 60 years and above (157; 49.5%). There were 176 (55.5%) females with most of them (158; 49.8%) having a tertiary level of education and the majority (276 (87.1%) were married.

One hundred and forty two (44.8%) of the patients had a family history of hypertension with the majority of the patients (211; 66.6%) in 1-10 years post-diagnosis of their hypertension. Comorbidity with hypertension occurred in 142 (44.8%) of the patients and there was an experience of adverse drug reaction in 85 (26.5%) of the patients. Less than half (40.4%) of the patients used herbal medicines at one time or the other. The mean body mass index in the control and intervention groups were 28.9 ± 7.5 Kg/m² and 27.9 ± 5.7 Kg/m² respectively ($p = .187$) and variation in the body weight categories between the control and intervention groups were not significantly different ($p = .090$).

The number of patients with comorbid conditions were 125 (39.4%) with heart failure being the most occurring (47; 14.8%) and the least were goitre and

asthma (2; 0.6% each respectively) and 21 (7.6%), had more than one comorbid condition (Figure 1).

Table 1: Socio-Demographic Characteristics of Hypertensive Out-Patients Attending Cardiology Clinic of University of Ilorin Teaching Hospital, Ilorin, Nigeria at baseline

Variable	Group N (%)		Total N (%)	χ^2/t	P
	Control n (%)	Intervention n (%)			
Age (years)	58.7 ±13.3	59.7 ±12.9	59.5 ±20.5	-0.72	0.472
Age group (years)					
<30	1(0.6)	3 (1.9)	4 (1.3)	2.114	0.549
30-45	28 (17.6)	22 (13.9)	50 (15.8)		
46 to 60	50 (31.4)	56 (35.4)	106 (33.4)		
>60	80 (50.3)	77 (48.7)	157 (49.5)		
Gender					
Male	72 (45.3)	69 (43.7)	141 (44.5)	0.083	0.773
Female	87 (54.7)	89 (56.3)	176 (55.5)		
Educational qualification					
Non-formal	20 (12.6)	31 (19.6)	51 (16.1)	4.116	0.249
Primary	18 (11.3)	22 (13.9)	40 (12.6)		
Secondary	38 (23.9)	30 (19.0)	68 (21.5)		
Tertiary	83 (52.2)	75 (47.5)	158 (49.8)		
Occupational status					
Unemployed	26 (16.4)	20 (12.7)	46 (14.5)	2.577	0.462
Self-employed	56 (35.2)	68 (43.0)	124 (39.1)		
Civil servant	42 (26.4)	35 (22.2)	77 (24.3)		
Retiree	35 (22.0)	35 (32.0)	70 (22.1)		
Marital status					
Single	1 (0.6)	4 (2.5)	5 (1.6)	8.72	0.033*
Married	146 (91.8)	130 (82.3)	276 (87.1)		
Divorced/separated	0 (0.0)	4 (2.5)	4 (1.3)		
Widowed	12 (7.5)	20 (12.7)	32 (10.1)		
Level of income**					
Low (< 30,000 Naira/Month)	92 (57.9)	101 (63.9)	193 (60.9)	1.223	0.269
High (≥ 30, 000 Naira / Month)	67 (42.1)	57 (36.1)	124 (39.1)		

p =significance level <0.005; *Significant difference; N=317 (Control 158; Intervention 159); **Based on National Minimum Wage of #30,000 / month

Table 2: Health Related Characteristics of Hypertensive Out-Patients Attending Cardiology Clinic of University of Ilorin Teaching Hospital, Ilorin, Nigeria at baseline

Variables	Group		Total N (%)	χ^2/t	P
	Control n (%)	Intervention n (%)			
Family history of hypertension					
Yes	69 (43.4)	73 (46.2)	142 (44.8)	7.241	0.027*
No	54 (34.0)	34 (21.5)	88 (27.8)		
Not sure	36 (22.6)	51 (32.3)	87 (27.4)		
Duration of since diagnosis (years)					
<1	13 (8.2)	17 (10.8)	30 (9.5)	2.277	0.517
1-10	107 (67.3)	104 (65.8)	211 (66.6)		
11-20	23 (14.5)	27 (17.1)	50 (15.8)		
>20	16 (10.1)	10 (6.3)	26 (8.2)		
Presence of comorbid condition					
Present	67 (42.1)	75 (47.5)	142 (44.8)	0.910	0.340
Absent	92 (57.9)	83 (52.5)	175 (55.2)		
Presence of Adverse Drug reaction					
Present	33 (20.7)	52 (32.9)	85 (26.5)	7.483	0.024*
Absent	126 (79.2)	106 (67.1)	232 (73.2)		
Use of herbal medicines					
Yes	61 (38.4)	67 (42.4)	128 (40.4)	0.537	0.464
No	98 (61.6)	91 (57.6)	189 (59.6)		
Body mass index (Kg/m ²)	28.9 ± 7.5	27.9±5.7	28.4±6.7	1.330	0.187
Body weight category (Kg/m ²)					
Underweight (<18.5)	5 (3.1)	5 (3.2)	10 (3.2)	1.126	0.890
Normal weight (18.5-24.9)	53 (33.3)	49 (31.0)	102 (32.2)		
Overweight (25-29.9)	50 (31.4)	49 (31.0)	99 (31.2)		
Obesity 1 (30-34.9)	30 (18.9)	37 (23.4)	67 (21.1)		
Obesity 2 (≥ 35)	21 (13.2)	18 (11.4)	39 (12.3)		

p =significance level <0.05; *Significant; N=317 (Control 158; Intervention 159); HTN= Hypertension; Kg=Kilogram; m²=meter square.

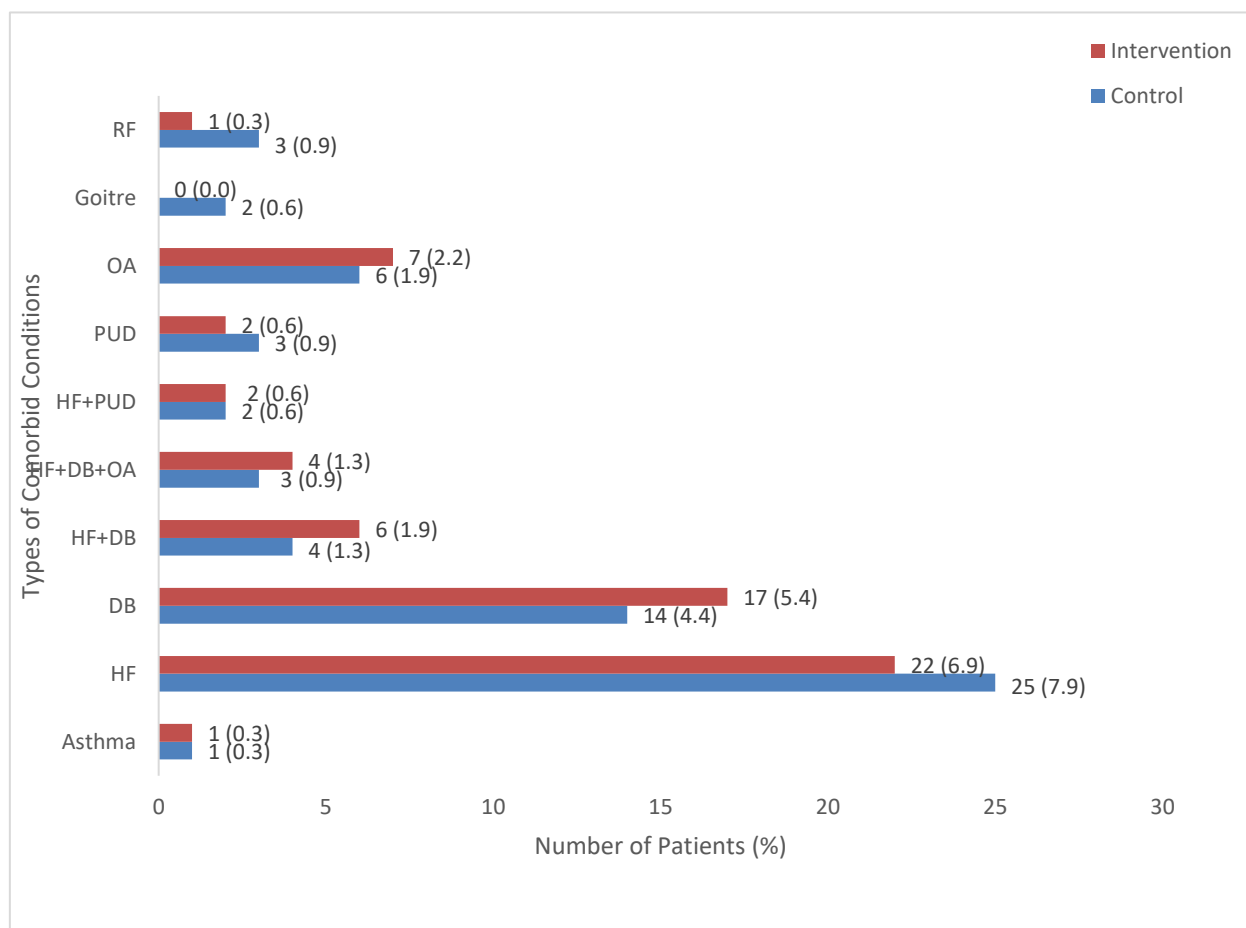


Figure 1: Types of Comorbid Conditions among Hypertensive Out-Patients Attending Cardiology Clinic of University of Ilorin Teaching Hospital, Ilorin, Nigeria

PUD=Peptic Ulcer Disease; HF=Heart Failure; RF= Renal Failure

Prescribing pattern of antihypertensive medication and medication use Practices among the Patients

The most commonly prescribed antihypertensive medicine combinations among the physicians were calcium channel blocker/Angiotensin receptor blocker/diuretics (64; 20.2%) followed by calcium channel blocker/diuretics (52;

16.4%) while the least was diuretics, 8 (2.5%). Patients' practice of antihypertensive medication use generally was above average (65.53%). The practice of correct use of drug in the right frequency as prescribed was the most highly practiced among the patients in the control group, 69% and 66.7% in the intervention group ($p = .658$) while the least was found among patients practice of medication refill within the hospital setting.

Regular use of medications which could indicate adherence level of patients to antihypertensive medication use was on the average, 55.7% in the in the control group and 51.6% in the intervention group) ($p = .462$). Chi square analysis was used to test for

the difference in the categories. Post-intervention the patients in the intervention group differed in practice of medication identification ($p = .018$) and hospital refill of prescribed medicines ($p = .020$).

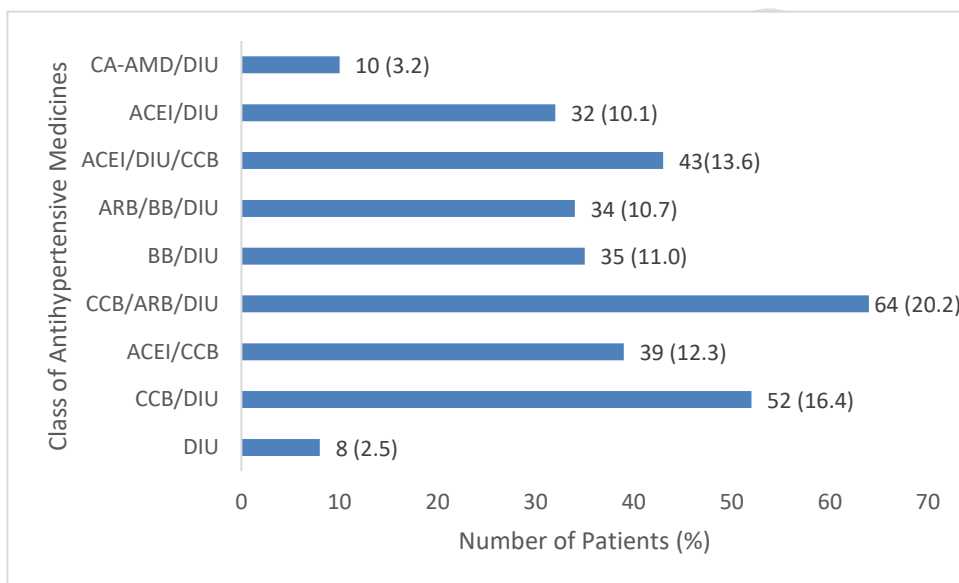


Figure 2: Types of Antihypertensive Medications used among Out-Patients Attending Cardiology Clinic at University of Ilorin Teaching Hospital, Ilorin Nigeria

COB=Calcium channel blocker; ACEI=Angiotensin converting enzyme inhibitor; DIU=Diuretics; ARB=Angiotensin receptor blocker; BB=Beta Blocker; CA-AMD= centrally acting alpha methyl dopa.

Table 3. Antihypertensive Medication Use Practices used among Out-Patients Attending Cardiology Clinic at University of Ilorin

Teaching Hospital, Ilorin Nigeria

Medication use practices	Baseline			6 Months			12 Months		
	CTG (n=158)	ITG (n=159)	p	CTG (n=149)	ITG (n=152)	p	CTG (n=136)	ITG (n=139)	p
Was the patient able to identify all the medicines being taken?									
Yes	95 (60.1)	98 (61.6)	.783	87 (68.4)	93 (61.2)	.621	71 (52.2)	92 (66.2)	.018*
No	63 (39.9)	61 (38.4)		62 (41.6)	59 (38.8)		65 (47.8)	47 (33.8)	
Were the medicines taken in the correct doses?									
Yes	94 (59.5)	102 (64.2)	.393	88 (59.1)	103 (67.8)	.117	82 (60.3)	91 (65.5)	.375
No	64 (40.5)	57 (35.8)		61 (40.9)	49 (32.2)		54 (39.7)	48 (34.5)	
Were the medicines taken in the correct frequencies?									
Yes	109 (69.0)	106 (66.7)	.658	94 (63.1)	103 (67.8)	.394	76 (55.9)	89 (60.0)	.168
No	49 (31.0)	53 (33.3)		55 (36.9)	49 (32.2)		60 (44.1)	50 (36.0)	
Was the patient refilling their prescribed medicines from hospital pharmacy?									
Yes	60 (38.0)	69 (43.4)	.326	74 (49.7)	76 (50.0)	.954	84 (61.8)	104 (74.8)	.020*
No	98 (62.0)	90 (56.6)		75 (50.3)	75 (50.0)		52 (38.2)	35 (25.2)	
Was the patient using the prescribed medicines regularly?									
Yes	88 (55.7)	82 (51.6)	.462	84 (56.4)	91 (59.9)	.122	76 (55.9)	91 (65.6)	.104
No	70 (44.3)	77 (48.4)		65 (43.6)	61 (40.1)		60 (44.1)	48 (34.5)	
Was the patient monitoring medicines for possible side effects?									
Yes	60 (38.0)	71 (44.7)	.227	77 (51.7)	81 (53.3)	.780	74 (54.4)	86 (61.9)	.210
No	98 (62.0)	88 (55.3)		72 (48.3)	71 (46.7)		62 (45.6)	53 (38.1)	

CTG=Control group; ITG=Intervention group; p=Significance level at < .05; *Significant difference; n= number per group

DISCUSSION

This study was conducted to examine the impact of pharmacist's intervention on patients' medication use in the management of hypertension. The socio-demographic characteristics of the patients at baseline showed a homogenous sample selection where most of the patients' characteristics in both control and intervention groups were comparable i.e not significantly different. The mean age of the participants was 59.4 ± 13.1 in a similar institutional based study carried out in Baltimore, Maryland, USA on knowledge of hypertension and lifestyle practices among hypertensive patients by Abu *et al.* (2018),²⁵ the mean age of the participants was 59.5 ± 12.4 years while Adedapo *et al.* (2015)²⁶ in a study carried out among hypertensive patients at University College Hospital, Ibadan, Nigeria it was found to be 57.1 ± 11 year. A lower mean age (41 ± 11.8 years) was obtained in a study carried out among hypertensive patients by Buang, *et al.* (2019)²⁷ in Malaysia. Higher mean age has also been found in other studies as seen in a Sri Lankan hospital study carried out by Ralapanawa *et al.* (2020)²⁸ where the mean age of 64.5 years was obtained. Studies by Demisse *et al.* (2017)²⁹ from Ethiopia and Odili *et al.* (2020)³⁰ from Delta State, Nigeria have identified increasing age as an associated factor with an increased incidence of hypertension. The most occurring age group in this study was >60 years. This was consistent with the age dependent distribution of hypertension. Increased the prevalence of hypertension has been associated with an increase in age from as low as 7.5% between 18-39 years to as high as 63.1% in the age of 60 and above.³¹ The

high occurrence of hypertension among female patients in this study was in agreement with the findings of Ezekwesili *et al.* (2016)³² in Anambra, South-Eastern Nigeria and Okubadejo *et al.*, (2019)³³ in Lagos, South-Western Nigeria where the prevalence of hypertension among females were 52.2% and 51.8% respectively. Behavioral risk factors like obesity, physical inactivity and hormonal changes in menopausal women are associated with gender differences in the epidemiology of hypertension.³⁴

Heart failure being the most occurring comorbidity among the patients (14.8%) has been known to result from long standing poorly controlled hypertension.³⁵ The proportion of patients with heart failure in this study was far lower than 43.5% reported by Rodeheffer, (2011)³⁶ as the expected prevalence of heart failure among hypertensive patients according to Framingham data.³⁷

The high prescribing rate of calcium channel blocker/angiotensin receptor blocker/diuretic combination (20.2%) among the prescribers was an indication that the patients were on good antihypertensive selection and the possibility of a substantial number of patients with resistant hypertension in addition to the presence of heart failure and diabetes comorbidities among the patients.¹⁰ This combination is very effective in the control of hypertension.³⁸ This prescribing rate found in this study was about the highest within this environment. A study carried out at University of Lagos Teaching Hospital had 16.5%,³⁹ while another study in Ekiti found 14.7%⁴⁰ and Kano 7.3%.⁴¹ Patients' practice

of medication use was comparable between the control and intervention groups at baseline and 6 months ($p>0.05$). Areas of difference post-intervention at 6 months was found only in patients' proper identification of medications ($p=.018$) and hospital refill of prescriptions ($p=.020$), where higher levels of practice were found in the intervention group compared to the control group. Regular use of antihypertensive medication was not found to be significantly different between the control and intervention groups. Regular use of medicines in this study could be seen as adherence rate to antihypertensive medication which was 55.9% in the control group and 65.9% in the intervention group which were not significantly different. This adherence rate was similar to a Romanian study, by Tilea *et al.* (2018)⁴² where patients' level of adherence to antihypertensive medicine was found to be 69.8% classified as a medium level of adherence.

CONCLUSION

The most commonly prescribed antihypertensive combination medicines were calcium channel blockers/angiotensin receptor blockers/diuretics. Also, heart failure and diabetes were frequently encountered comorbidities. Pharmaceutical care interventions significantly improved patients' medication identification and regular refill of medication in the intervention group compared to the control group.

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Conflict of interest

Authors declare no conflict of interest in the conduct of this study

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