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Original article

Prescription pattern of anti-hypertensive agents used in the outpatient department of general medicine in a tertiary care teaching hospital

Dr. Lalita Gupta[1], Dr. Kalpana Bharani[2], Dr. Abhay Kumar John[3], Dr. Vinod Porwal[4]

[1] Dr. Lalita Gupta MBBS, DOMS ,Junior Resident Department of Pharmacology, Sri Aurobindo Medical College and PG Institute Indore, Madhya Pradesh, 453555
[2] Dr. Kalpana Bharani MD Pharmacology , Professor Department of Pharmacology, Sri Aurobindo Medical College and PG Institute Indore, Madhya Pradesh,453555
[3] Dr. Abhay Kumar John MD Pharmacology, Professor Department of Pharmacology, Sri Aurobindo Medical College and PG Institute Indore, Madhya Pradesh,453555
[4] Dr. Vinod Porwal MD Medicine , Professor Department of medicine, Sri Aurobindo Medical College and PG Institute Indore, Madhya Pradesh, 453555
*Corresponding author**

Abstract

Hypertension is a major contributor to cardiovascular morbidity and mortality. Once considered a disease of older adults, it is now increasingly seen in younger populations due to obesity and diabetes. While lifestyle modification plays a role, antihypertensive medications remain the mainstay of treatment. However, many patients remain untreated or inadequately managed, underscoring the need to evaluate prescribing trends. This study was conducted at a tertiary care teaching hospital in central India to assess patterns of antihypertensive drug use. The objectives were to compare single versus combination therapy and to identify preferred drugs in patients with comorbidities. Angiotensin receptor blockers (ARBs) were the most frequently prescribed agents (46%), either alone or in combination. Multidrug therapy was used in 56% of patients, with the ARB–calcium channel blocker (CCB) combination being the most common (35.7%). Diabetes mellitus was the most prevalent comorbidity (40%), for which ARBs with CCBs were preferred. Overall, prescribing practices reflected consideration of age and comorbidities and were consistent with national and international hypertension guidelines.

Keywords : Antihypertensive drugs, hypertension, prescription pattern

Introduction

Hypertension is one of the leading risk factors for cardiovascular disease and premature death worldwide. Its burden is particularly high in low- and middle-income countries like India, where most hypertension-related deaths occur. The World Health Organization (WHO) estimates that around 1.28 billion adults aged 30–79 years are living with hypertension, prompting a global target to reduce its prevalence by 33% between 2010 and 2030.[1,2,3]

Despite the proven effectiveness of antihypertensive medications in reducing risk, a large proportion of individuals with hypertension remain untreated or inadequately treated. To guide effective management, several international and national bodies—including the WHO, the Joint National Committee (JNC), and the Cardiology Society of India—have developed standardized guidelines for detection and treatment. According to JNC 8, hypertension in adults is defined as systolic blood pressure ≥140 mmHg or diastolic ≥90 mmHg, with slightly higher thresholds for those aged 60 years or above.[4-5]

These guidelines are periodically updated based on clinical evidence to assist healthcare providers in selecting appropriate antihypertensive therapy [4, 6.] .Lifestyle modification remains the cornerstone of initial management, but when medication is required, first-line options include ACE inhibitors, ARBs, thiazide diuretics, and calcium channel blockers [4,7,8]. Combination therapy is often preferred for stage 2 hypertension to enhance efficacy and minimize adverse effects [4, 9.] Using agents with complementary mechanisms improves blood pressure control while minimizing side effects. Once-daily dosing is preferred to improve patient adherence [4.]

Prescription pattern studies play a crucial role in assessing the real-world use of antihypertensive drugs, identifying prescribing trends in patients with comorbidities, and evaluating adherence to treatment guidelines[1,3,4.] Conducting such studies regularly could also support medication reconciliation efforts in chronic disease management.

Material and Methods

This prospective observational study, after obtaining ethical clearance, was conducted in a tertiary care teaching hospital of central India. The study was conducted for a period of March 2024 to March 2025 with a sample size of 400. Adults in the age group of 18 – 80 years with known case or newly diagnosed cases of hypertension who are on antihypertensive drugs were included in the study while pregnant and lactating females were excluded.

Sample size calculation

Sample size is calculated on taking account

Formula: $n= Z^2 \cdot P(1-P)/d^2$

Z= 1.96 for 95% confidence

P= Prevalence of hypertension (22.4% according to NFHS5 among all persons > 15 years) [22]

d= Absolute precision (5%)

n= minimum required sample size- 266.4 (approximate 267))

Since our study enrolled 400 patients, which is more than the calculated minimum of 267, because study duration (one year) and the high patient flow at our tertiary care hospital allowed us to enroll more patients than the calculated minimum..

Prescription pattern of antihypertensive drugs was categorized according to age, gender, body mass index, class of drug, single or multidrug treatment and co morbidity and the drugs used in associated comorbidities with hypertension. Data was collected and entered in Microsoft Excel and analysis was done using WinPepi software (Version 11.65)[10] Categorical variable was expressed in terms of frequency and percentage and graphs were prepared using Microsoft excel sheet.

Observations and Results

A total of 400 patients were taken for the present study who were on antihypertensive drugs. Their prescriptions were evaluated to study their prescribing patterns. The observations of this study are as follows.

Distribution of Cases According to Gender and Age:

Out of total 400 cases, 234 (58.5%) were male and 166(41.5%) were female.

Among 400 cases, a maximum of 157 i.e. 39.25% of the total cases were in the age group of 51 – 60 years and 4 cases were observed in the age group of 18–20 (1%) and 12 cases (3%) in age group 21-30, 52(13%) cases were in age group 31-40, 1n 41-50 age group 115(28.75%) participant were there, and 60 (15%) in age group above 60.

Distribution of Cases According to the Class of Drug

Table 1 and figure 1show distribution of study cases according to the class of antihypertensive drugs prescribed. Angiotensin Receptor Blockers (ARBs) was the most prescribed class of drug accounting to 46.48% of the total drugs prescribed i.e. 330 cases were on ARBs, Telmisartan was the drug prescribed from this class of antihypertensive drugs. This was followed by Calcium Channel Blockers (CCBs) i.e. Amlodipine in 160 cases (22.54%). Prescriptions of Diuretics, Hydrochlorothiazide and Chlorthalidone being the drug prescribed from this class, were 138 in number, making it 19.44% of the total. 33 (4.64%) were on Enalapril, an ACE-Is, 33 (4.36%) were on Metoprolol, a β – blockers and 18 (2.54%) were on Prazosin an α – blocker in their prescriptions.

These drugs were either prescribed as a single drug or in combination with other antihypertensive agents. If the combination therapy was being prescribed, then the Fixed Dose Combinations (FDCs) were preferred.

ARBs being the top on the list, which was prescribed to 330 cases either as a single drug or in combination with other antihypertensive agents, 32.9% of it, was prescribed in 51 – 60 years of age, 32.3% in 41 – 50 years, 20.1% in 31-40 years, 13.5% in 61 – 70 years. The single cases in each age group of 18 – 20 and 21 – 30 years received 0.6% of the share.Of 160 prescriptions with CCBs, 90 were in 51 – 60 years, 44 in 61 – 70 years and 26 in 41 – 50 years.In 138 prescriptions, diuretics were prescribed. 18.2% were in 41 – 50 years, 49.4% in 51 – 60 years and 32.4% in 61 – 70 years.Among 33 prescriptions with ACE-Is, 21.7% were in 41 – 50 years, 65.2% in 51 – 60 years and 13.1% in 61 – 70 years.31 prescriptions had β-blockers, 52.4% were in 51 – 60 years and the rest 47.6% in 61 – 70 years of

age.α-blockers were prescribed to 18 cases of 51 – 60 years and 61 – 70 years. 9 in each age group received the same.

Table 1: Distribution of cases according to the class of drug

Class of drugs prescribed	Cases	Percentage
Diuretics (Hydrochlorothiazide)	138	19.44
β – blockers (Metoprolol)	31	4.36
CCBs (Amlodipine)	160	22.54
ACE – Is (Enalapril)	33	4.64
ARBs (Telmisartan)	330	46.48
α – blockers (Prazosin)	18	2.54
Total	**710**	**100**

Table 2 shows distribution of study cases according to the total number of antihypertensive drugs prescribed. Among 400 cases, 176 cases were on monotherapy i.e., 44% cases were prescribed single antihypertensive agent. 94 cases (23.5%) were prescribed two antihypertensive drugs. Three and four drugs were prescribed to 92 (23%) and 38 (9.5%) cases respectively.

All cases upto 20 years of age were prescribed single antihypertensive drug. While among 21 – 40 years cases, 71.2% were on single drug, 11.9% were on two drugs and 16.9% were on three drugs for the treatment of hypertension in the age group of 41 – 60 years, 14.3% cases were prescribed one drug. 44.1% were on two drugs, 32.5% were on three drugs and 9.1% were on four antihypertensive drugs. 39 cases lying in the age group of 61 – 70 years, 20.7% were on two drugs for hypertension. 37.9% and 41.4% of cases were prescribed three and four antihypertensive drugs respectively.

Table 2: Distribution of cases according to the number of drugs prescribed

No. of anti-HTN drugs prescribed	Cases	Percentage
One	176	44
Two	94	23.5
Three	92	23
Four	38	9.5
Total	**400**	**100.0**

Distribution of Cases According to the Various Combinations of Drugs Used

Table 3 shows the distribution of study cases according to the various combinations of antihypertensive drugs used. Most commonly combined two drugs were from the class, CCB and ARB, used in 35.7% of total 224 patients on combination therapy. Major chunk of 12.94% in 224 prescriptions comprised of the combination of three drugs from the diuretic, CCB and ARB class of antihypertensive agents.α-blocker was used in combination with diuretic, CCB and ARB in 8.% of the cases on multidrug therapy to control the raised BP.

Table 3: Distribution of cases according to the various combinations of drugs used

Combinations of antihypertensive drugs	Cases	Percentage
CCB + ARB	80	35.7
Diuretic + ACE-I	24	10.71
CCB + ACE-I	15	6.80
β-blocker + CCB	18	8.04
Diuretic + ARB	7	3.12
Diuretic + CCB + ARB	29	12.94

Diuretic + β-blocker + ACE-I	9	4.01
β-blocker + CCB + ARB	4	1.78
Diuretic + CCB + ACE-I	2	0.9
Diuretic + CCB + ARB + α-blocker	18	8.0
Diuretic + β-blocker + CCB + ARB	18	8.0
Total	**224**	**100.0**

Table 4 shows distribution of study cases according to the associated co-morbid condition
Diabetes mellitus was the most common co-morbid disorder, associated in 40% of the study population with hypertension. Dyslipidemia was associated in 25%, while 25% of the patients were obese, 10% were having history of IHD and 5% were having CCF. Past history of stroke (CVD) was present in 5% of the cases.31.5% of the remaining cases were free from any associated co-morbid condition. All the patients with the association of co-morbid condition were on treatment of the respective disorder.
DM being the most commonly associated co-morbid condition, i.e. 160 cases in 400, 60.3% were from age group of 51 – 60 years. 20.5% in 61 – 70 years and 19.2% in 41 – 50 years age group were diabetics. Dyslipidemia was the second most common disorder associated with hypertension. Out of 100 patients with the disorder, major chunk of 58.4% were in the age group of 51 – 60 years. In each age group, 41 – 50 years and 61 – 70 years, 20.8% cases were having dyslipidemia. Obesity followed dyslipidemia in the total count which accounted for 100 cases. 44.7% cases were obese in the age group of 51 – 60 years. 21.3% cases were obese in 41 – 50 years of age. 17% obese lied in the age of 31 – 40 years and 12.8% in 61 – 70 years. The only single cases in each age groups of 18 – 20 and 21 – 30 years were found to be obese. In 40 patients of IHD, 55.6% were aged 61 and above while the remaining 44.4% were between 51 and 60 years of age.CCF was the co-morbidity in 20 cases, of which 14 were in 51 – 60 years and 6 in 41 – 50 years. History of stroke was found in 20cases. 126 patients were not having any associated co-morbid condition.

Table 4: Distribution of cases according to the associated co-morbid condition

Associated co-morbidity	**Cases**	**Percentage**
Diabetes mellitus (DM)	160	40
Ischemic heart disease (IHD)	40	10
Dyslipidemia	100	25
Cerebrovascular disease (CVD)	20	5
Congestive cardiac failure (CCF)	20	5
Obesity	100	25
No co-morbidity	126	**31.5**

Table 5 shows prescription pattern of various classes of antihypertensive drugs among study cases with associated co-morbidity.
Out of total 160 patients of DM, 62.5% were on diuretics, 77.5% on CCB, 15% on ACE-Is, 78.75% on ARBs and 10.% on α-blockers. Of the 40 IHD patients 16 (40%)were prescribed β-blockers and 70% CCBs, while 44.% were having an addition of diuretics in their prescriptions. 39% cases of dyslipidemias were on diuretics, 24% on β-blockers, 82% on ARBs and 20.% on α-blockers. CCBs were prescribed to 68% patients of dyslipidemia.The 20 patients with history of stroke were prescribed ACE-Is, Among the 20 patients of CCF, all were advised diuretics and ACE-Is. Two patients among them were additionally on β-blockers. Obese individual 80% were on ARBs. 50% of them were prescribed additional diuretic agent. CCBs were also one of the drug included in50% of the prescriptions .In the 126 solely hypertensive individuals, without any co-morbidity, 79% were on ARBs, 23% on CCBs and 18.25% on diuretics.All these classes of drugs were either prescribed alone or in combination of two or more drugs.Among 160 diabetics, 11.6% were on monotherapy, 26.9% on two drugs, 48.7% on three drugs and 12.8% on four drugs. 100 patients had dyslipidemia, of which, 12.5% were on two drugs, 58.3% on three drugs and

29.2% on four drugs. All the 20 patients with history of stroke were on two antihypertensive drugs, .Among the 20 cases of CCF, 18 received two drugs and the remaining 2 were prescribed three drugs for hypertension. Among 100 obese individuals, 57.4% received the combination of three drugs. Single drug was prescribed to 21.3% of obese cases. The rest 21.3% cases had four antihypertensive drugs in their prescriptions.126 cases in 400 were not having any co-morbidity. 85.9% of them received only one antihypertensive drug whereas, 10.3% and 3.8% had two and three drugs in their prescriptions.

Table 5: Prescription pattern ofantihypertensive drugs with associated co-morbidity

Associated co-morbidity (n)	Class of the antihypertensive drug prescribed											
	Diuretics		β – blockers		CCBs		ACE – Is		ARBs		α – blockers	
	n	%	n	%	n	%	n	%	n	%	n	%
DM (160)	100	62.5	–	–	124	77.5	24	15	126	78.75	16	10
IHD (40)	16	40	28	70	28	70	–		24	60	–	–
Dyslipidemias (100)	39	39	24	24	68	68	–	–	82	82	20	20
CVD (20)	2	10	–	–	8–	40	12	60	8	40	–	–
CCF (20)	20	100	8	40	–	–	18	90	2	10	–	–
Obesity (100)	50	50	–	–	46	46	–	–	57	57	–	–
No comorbidity (126)	23	18.25	–	–	29	23	–	–	100	79	–	–

Discussion

Hypertension is a chronic condition with rising prevalence globally and in India. Often classified as primary or essential hypertension, it is a major risk factor for target organ damage and increased mortality, as highlighted by the INTERHEART and INTERSTROKE studies. While previously considered a disease of older adults, hypertension is now increasingly observed in younger adults (18–40 years), posing significant health and economic implications. Guidelines recommend gradual blood pressure reduction, drug selection based on age, comorbidities, and socioeconomic factors, and the use of combination therapy to enhance efficacy and minimize side effects.

In this study of 400 patients, males (58.5%) predominated, and the majorities were aged 51–60 years, consistent with previous Indian studies. Diabetes mellitus (40%) was the most common comorbidity, followed by dyslipidemia, obesity, IHD, CCF, and stroke.

ARBs were the most frequently prescribed antihypertensives (46.5%), followed by CCBs (22.5%) and diuretics (19.4%). Combination therapy was preferred in 56% of cases, with the ARB–CCB combination most common (35.7%). Prescription patterns varied by comorbidity: diabetics predominantly received ARBs and CCBs, dyslipidemia patients were treated with CCBs and ARBs, obese patients received ARBs, and IHD patients were prescribed β-blockers and CCBs. These findings largely align with Indian hypertension guidelines, though some differences with other regional studies reflect variations in patient demographics, comorbidities, and drug availability.

Overall, rational prescribing considering patient factors and guideline recommendations is essential for effective long-term hypertension management.

Conclusion

Hypertension is becoming evident in the middle age group. Combinations of drugs were used most commonly to keep check on the raised blood pressure. Prescribing pattern of antihypertensive drugs seemed to be specific to the age and associated co-morbidity. The pattern of the prescribed drugs was in accordance with the recommended national and international guidelines including the Indian Guidelines on Hypertension.

Our study had some limitations. First, being a single-center study carried out in a tertiary care teaching hospital, the sample may not be a complete representation of whole Indian patient population. Second, the study was conducted in

a tertiary care setting, patients receiving treatment at primary or secondary centers may have different patterns of antihypertensive drug use. Third, observational nature of the study limited the evaluation of other factors influencing prescription patterns such as physicians' background and knowledge, influence of hospital administration and pharmaceutical companies, and availability of drugs.

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