



Original Research Article

A Prospective Study of Prescription Patterns of Antihypertensive Drugs in Hypertensive Patients at a Tertiary Care Hospital

Authors

Rajesh Kumar Jangir¹, Akhtar Ali^{1*}, Javed Ahamed¹, Anusuya Gehlot², Archana Vyas¹,
Kamal Kumar Batar¹

¹Resident, Department of Pharmacology, Dr. S.N. Medical College Jodhpur (Rajasthan)

²Head of the department and Senior Professor, Department of Pharmacology, Dr. S.N. Medical College Jodhpur (Rajasthan)

*Corresponding Author

Dr Akhtar Ali

Resident, Department of Pharmacology, Dr. S.N. Medical College Jodhpur (Rajasthan), India

Email: drakhtar06@gmail.com, Mobile No- 8058961071

Abstract

Aims: To evaluate the prescribing pattern among hypertensive patients and analysis these prescriptions to help in improving the quality of care provided.

Methodology: This was a prospective and observational study. Patients of both sex and all age groups those attended the outpatient department (OPD) were included in this study. Acute cerebrovascular accident, acute MI, acute left ventricular failure and pregnant women were excluded from this study.

Results: Out of 350 patients, 193 (55.14%) were male and 157 (44.85%) were female. The average number of drugs prescribed per prescription was 2.52 in our study with a range of 1 to 7. A maximum number of patients (40.86%) were received two antihypertensive drugs followed by single antihypertensive drug (34.85%). CCB was the most common (39.14%) used antihypertensive drugs. Total 138 (39.42%) patients were prescribed fixed-dose drug combination, among this Atenolol + amlodipine FDC was the most commonly used FDC(40.28%)

Conclusion: Hypertension and its complications can be controlled by diet control, regular exercise, medicines and by time to time follow up. Most commonly prescribed drugs were CCB in this study and ACE inhibitors was most commonly prescribed in diabetic patients. While most common prescribed antihypertensive drug in IHD patients was beta blockers.

Keywords: Prescription Pattern, Antihypertensive drugs, Calcium Channel Blocker, FDC.

Introduction

Hypertension is a major health problem throughout the world and it continues to be an important public health concern because is associated with morbidity, mortality and economic impact on the society. It is a significant risk factor

for cardiovascular, cerebrovascular and renal complications¹. In terms of attributable deaths, raised blood pressure is one of the leading behavioral and physiological risk factor to which 13% of global deaths are attributed. Hypertension is reported to be the fourth contributor to

premature death in developed countries and the seventh in developing countries². A whopping 9.4 million death occurs worldwide every year because of cardiovascular diseases and in India, these are estimated to be responsible for 1.5 million deaths annually³. According to Directorate General of Health Services, Ministry of Health and Family Welfare, Government of India, the overall prevalence of hypertension in India by 2020 will be 159.46/1000 population⁴.

Hypertension is a very common disorder, particularly past middle age. It is not a disease itself, but it is an important risk factor for cardiovascular mortality and morbidity. The continuous relationship between the level of blood pressure and cardiovascular risk makes any numerical definition and classification of hypertension somewhat arbitrary. Therefore, a definition of hypertension is usually taken as that level of arterial blood pressure associated with doubling of long term cardiovascular risk⁵.

The basis of the measurement of blood pressure established by the description of the stethoscopic sounds by Nikolai Sergeevich Korotkoff in 1905 enabled research to grow from anecdotal to objective approaches.⁶

Antihypertensive drugs are prescribed mainly to reduce the morbidity and mortality caused by hypertension and its complications. Many a time patient require more than one drugs for effective control of hypertension. Various classes of antihypertensive drugs like diuretics, inhibitor of renin-angiotensin system, Calcium Channel Blockers (CCBs) and Beta Blockers (BBs) have been shown to reduce complications of hypertension and may be used for initial drug therapy⁷.

Several guidelines on its classification and management have been developed. Some of the bodies which have developed guidelines are American Society of Hypertension/International Society of Hypertension (ASH/ISH), Joint National Committee (JNC) on Detection, Evaluation and Treatment of high blood pressure, European Society of Hypertension (ESH)

/European Society of Cardiology (ESC), National Institute for Health and Care Excellence (NICE) and Japanese Society of Hypertension. The JNC VIII guidelines published in 2014 are the most recent guidelines for the management of hypertension in different clinical settings. These guidelines were developed based on a systematic review of the literature to help clinicians. The available guideline recommends different goal BP level and drug treatment options according to the patient's individual clinical need⁸.

The development of drug prescribing pattern was sparked by initiatives taken in Northern Europe and the United Kingdom in the mid-1960s.⁹ The ultimate goal of drug prescribing pattern must be to assess whether drug therapy is rational or not. To reach this goal, methods for auditing drug therapy towards rationality are necessary¹⁰.

Material and Methods

This was a prospective and observational study. The diagnosis and line of treatment to be given was decided by the physician in charge of the Department of Medicine. No additional drugs or investigations were advised by us during the study period. Patients of both sex and all adults age groups will be attending the outpatient department (OPD) and would be prescribed antihypertensive drugs were selected for the study. Patients with a hypertensive emergency, cerebral stroke, acute myocardial infarction, Acute left ventricular failure and pregnant women excluded from this study. All the information related to the patients such as name, age, sex, occupation, personal history including smoking status, relevant medical history, past history, family history, and investigations details were obtained from the patient's case file and were recorded in the Case Record Form.

All the pharmacotherapeutic agents used during the treatment of Hypertension were recorded in details. The dose of the drug, duration of treatment, the frequency of administration and dosage form, were recorded in Case Record Form.

After recording the obtained information in the Case Record Form the data were analyzed further as a demographic profile of study patients and Drug prescribing pattern including routes of administration, type of therapy (Monotherapy / Combination therapy), the category of the drug used in the treatment and fixed-dose combination prescribed.

Results

Age & Sex Distribution of Study Patients

Out of 350 patients, 193 (55.14%) were male and 157 (44.85%) were female. Maximum patients

belonged to the age group of more than 59 years-210 (60%), followed by age group 50-59 years-97(27.71%) and age group 40-49 years-33 (9.42%). In this study, no patient of either sex was diagnosed in the age group 18-29 years while in the age group 30-39 years-10 (2.85%) only male patients were detected with hypertension. The mean age of male patients was 61.66+11.79 years and female was found 61.83+9.89 years. Mean age of total patients was 61.74+10.96 years (Table 1, Figure 1).

Table 1: Age and Sex Distribution of Study Patients

Age (yrs)	Male		Female		Total
	N	%	N	%	
18-29	0	0.00	0	0.00	0
30-39	10	5.18	0	0.00	10
40-49	21	10.88	12	7.64	33
50-59	43	22.28	54	34.39	97
>59	119	61.66	91	57.96	210
Total	193	100.00	157	100	350
Mean+SD	61.66+11.79		61.83+9.89		61.74+10.96

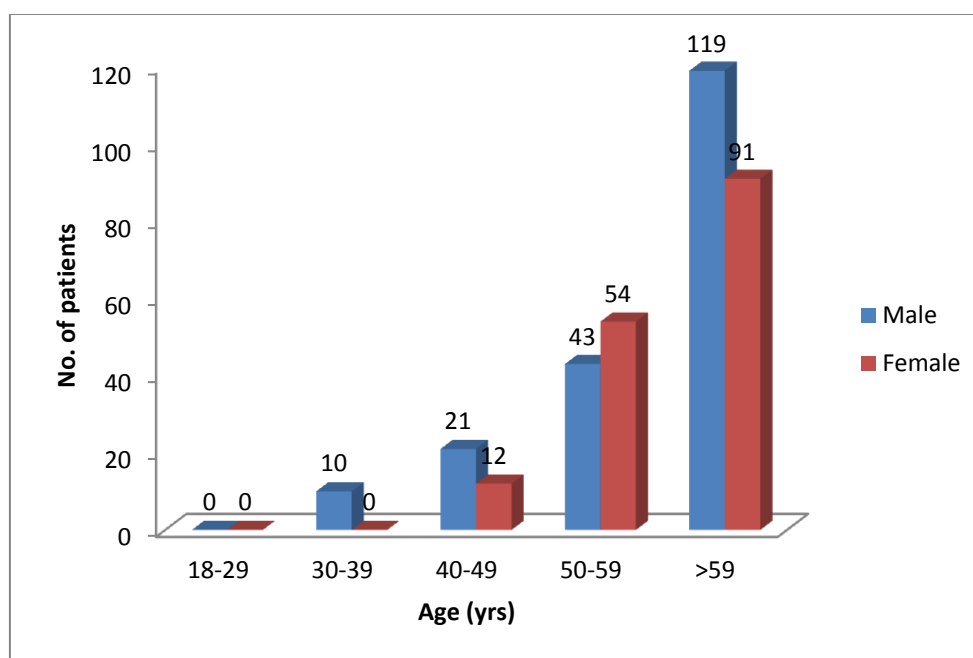


Figure 1: Age and Sex Distribution of Study Patients. Maximum patients belonged to the age group of more than 59 years and there are no patients less than 30 years of age.

Number of Total Drugs Prescribed Per Prescription

A maximum number of drugs prescribed in this study was seven which were prescribed to 2

patients of hypertension with co-morbid condition IHD. A maximum number of drugs prescribed in categories- hypertension alone, total 457 drugs prescribed in patients of hypertension alone and

no. of patients in this category was 235, so mean no. of drugs prescribed in this category was 1.94. Total 315 drugs prescribed in patients with co-morbid condition diabetes mellitus and no. of patients in this category was 95, so mean drugs prescribed in this category was 3.31. In patients with the co-morbid condition, IHD totals 93 drugs prescribed in 17 patients so mean no. of drugs

prescribed in this category was 5.47. In patients with CHF total of 17 drugs prescribed in 3 patients so mean no. of drugs prescribed in this category was 5.6. None of the patients with comorbid condition received less than two drugs. The average number of drugs prescribed per prescription was 2.52 in our study with a range of 1 to 7. (Table2, Figure 2).

Table 2: Number of total drugs prescribed per Prescription

No. of drugs	No. of patients hypertension alone (N=235)	No. of patients hypertensions co-morbid DM (N=95)	No. of patients hypertension co-morbid with IHD (N=17)	No. of patients hypertension co-morbid with CHF (N=3)	Total no of patients n=350
1	81	0	0	0	81
2	96	20	0	0	116
3	48	38	0	0	86
4	10	25	2	0	37
5	0	11	7	1	19
6	0	1	6	2	9
7	0	0	2	0	2
Total	457	315	93	17	882
Average no. of drugs	1.94	3.31	5.47	5.6	2.52

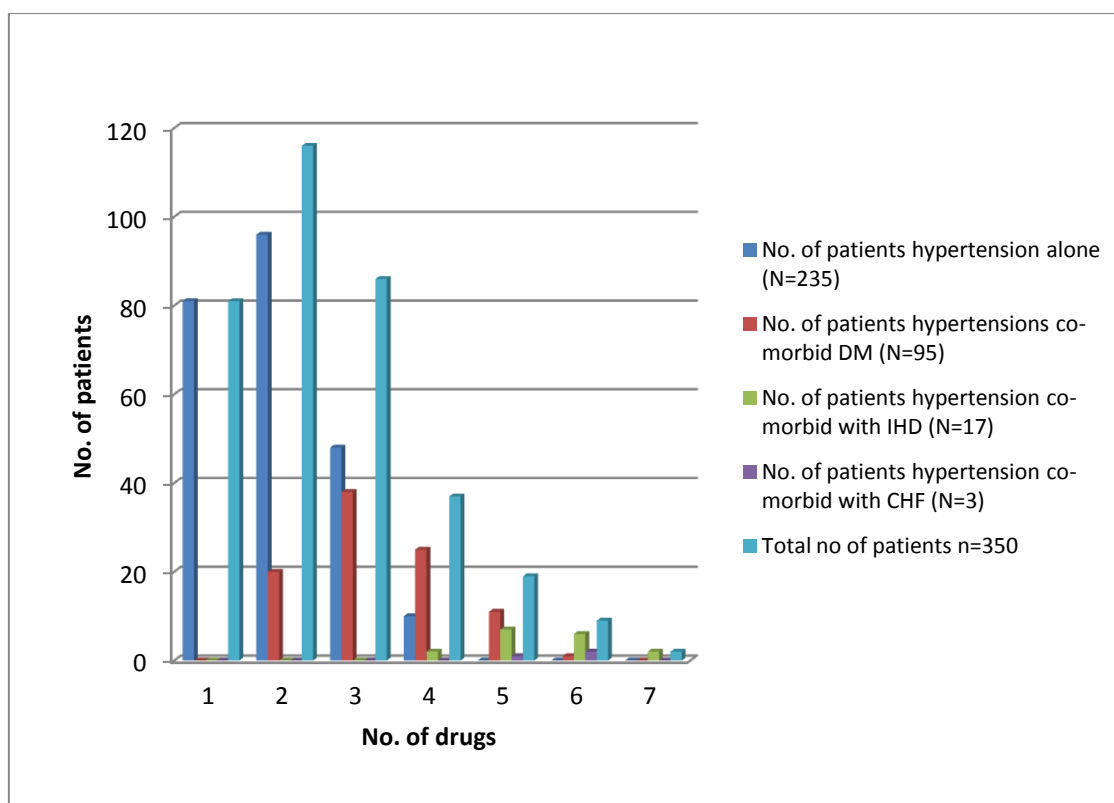


Figure 2: Number of Total Drugs Prescribed Per Prescription. A maximum number of drugs prescribed in categories- hypertension alone. The average number of drugs prescribed per prescription was 2.52 in our study with a range of 1 to 7.

Antihypertensive drugs prescribed per prescription

In this study, we found patients received antihypertensive drugs ranging from 1 to 4. A maximum number of patients (40.86%) were on two drugs followed by single drug (34.85%) and three drugs (20.57%). Only 3.71% of patients received four drugs. In the group of patients of hypertension alone, a mean number of antihypertensive drugs was found 1.94 – 34.46% received one antihypertensive drug. 40.85% of patients have prescribed two drugs. 20.42% and 7.23% of patients in this category received three and four drugs respectively. In the group of patients of hypertension with diabetes, ischemic

heart disease and CHF mean a number of antihypertensives were 1.77, 2.52, and 2.66 respectively. In the group of hypertension comorbid with diabetes 41.05% of patients were on monotherapy while 42.10% and 15.79% of patients received two and three drugs in this category. In the group of hypertension comorbid with ischemic heart disease, the highest numbers of patients (41.17%) were prescribed three drugs while 35.29% of patients were prescribed two drugs. An equal proportion of patients (11.76%) were prescribed the single drug and four drugs. 2 out of 3 patients of hypertension comorbid with CHF received three antihypertensive drugs while one received two drugs. (Table 3, Figure 3.)

Table 3: No. of antihypertensive drugs prescribed per prescription

No. of drugs	No. of patients of hypertension alone (N=235)	No. of patients of hypertension co-morbid with DM (N=95)	No. of patients of hypertension co-morbid with IHD (N=17)	No. of patients of hypertension co-morbid with CHF (N=3)	Total no. of patients N=350
1	81(34.46%)	39(41.05%)	2(11.76%)	0	122 (34.85%)
2	96(40.85%)	40(42.10%)	6(35.29%)	1(33.33%)	143 (40.86%)
3	48(20.42%)	15(15.79%)	7(41.17%)	2(66.66%)	72 (20.57%)
4	10(4.25%)	1(1.05%)	2(11.76%)	0	13 (3.71%)
Total	457	168	43	08	676
Average no. of drugs	1.94	1.77	2.52	2.66	1.93

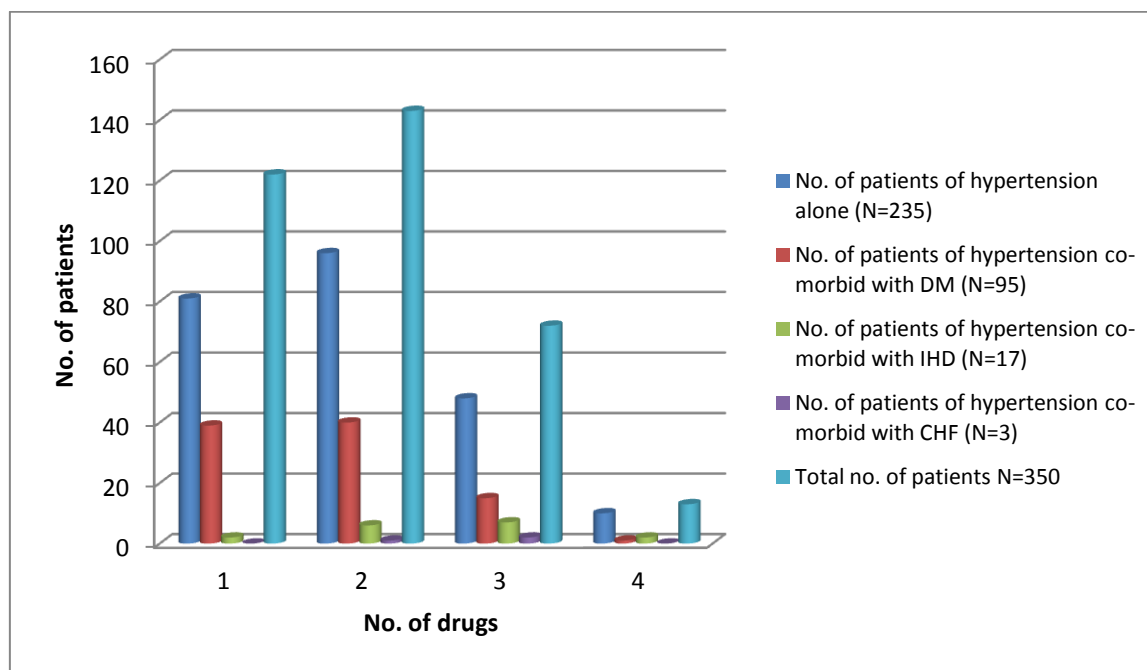


Figure 3: No. of antihypertensive drugs prescribed per prescription. A maximum number of patients (40.86%) were on two drugs and only 3.71% of patients received four drugs.

Commonly used antihypertensive drugs in study patients

Total of 235 patients was observed without any co-morbidity. Among these patients, Amlodipine was the most common (58.72%) used the antihypertensive drug followed by

Hydrochlorothiazide in 25.53 patients and Atenolol in 25.11% patients. Enalapril was prescribed in 17.45% of patients while Metoprolol was used in 17.02% patients. Least prescribed was Frusemide and Carvedilol in 1.28% patients (each), shown in Table 4 and Figure 4.

Table 4: Commonly used antihypertensive drugs (without any comorbidity)

Antihypertensive group	Drugs	No. of patients	Percentage(%)
ACE inhibitor	Enalapril	41	17.45
	Ramipril	36	15.31
Angiotensin receptor blocker	Losartan	33	14.04
	Telmisartan	16	6.80
	Valsartan	12	5.10
Calcium channel blocker	Amlodipine	138	58.72
Beta-blocker	Atenolol	59	25.11
	Metoprolol	40	17.02
	Carvedilol	3	1.28
Diuretic	Hydrochlorothiazide	60	25.53
	Torseamide	5	2.12
	Chlothaldione	4	1.70
	Frusemide	3	1.28
Alpha 2 agonist	Clonidine	6	2.55

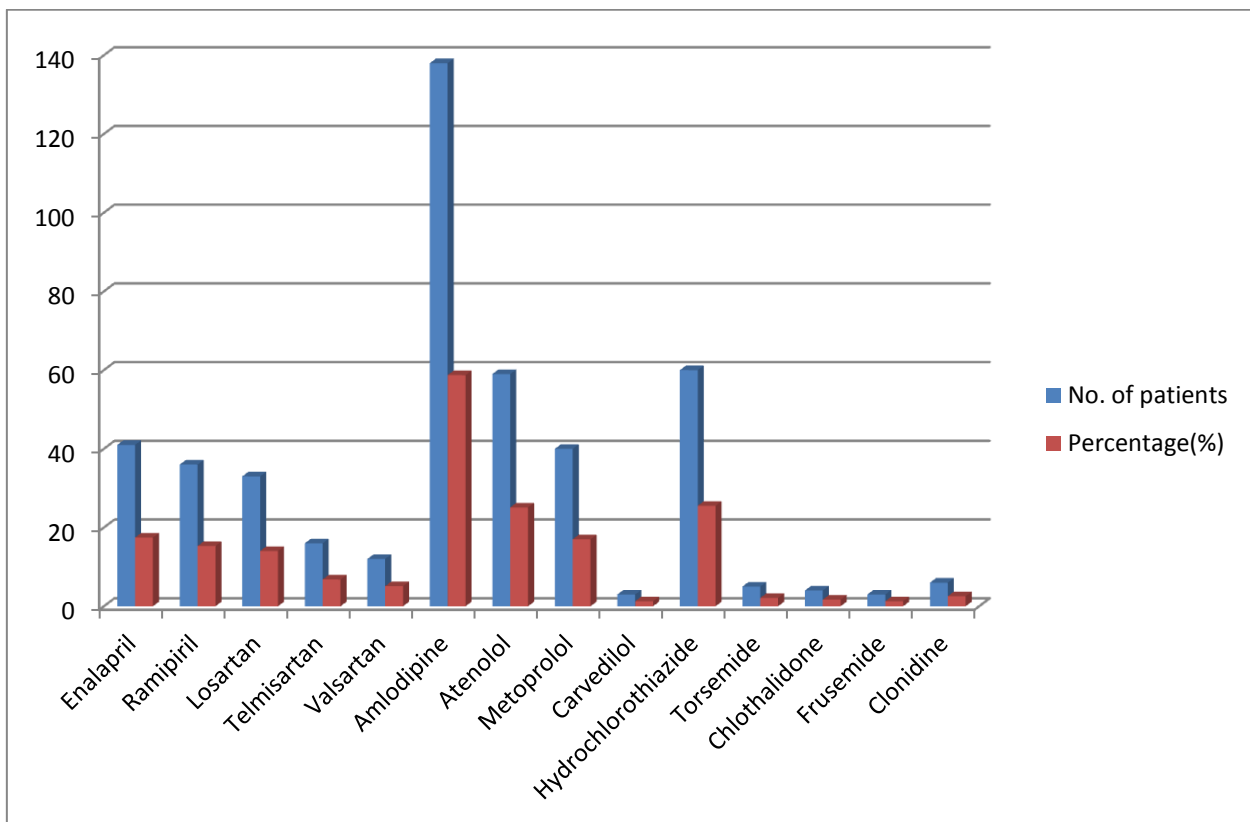


Figure: 4. Commonly used antihypertensive drugs (without any comorbidity). Amlodipine most commonly (58.72%) used the antihypertensive drug and second most common antihypertensive drug was hydrochlorothiazide.

Commonly used antihypertensive group in study patients

Among the antihypertensive groups, calcium channel blockers were the most commonly prescribed antihypertensive group (53.71%), followed by beta-blockers (44.57%), ACE inhibitors (41.43%), diuretics (29.43%) and ARBs (22.57%). Alpha agonist (1.71%) were the least prescribed antihypertensive groups.

Hypertensive patients without any co-morbidities were prescribed with calcium channel blockers most commonly (58.72%) while 43.40% of this patient received group beta blockers. ACE inhibitors and diuretics were the 3rd and 4th most common antihypertensive groups in this category of patients. ACEIs were advised in 32.77% while diuretics were given 30.64% of patients. In 2.55% of these patients, alpha agonist was given.

In a group of patients of hypertension co-morbid with diabetes mellitus, 57(60%) and 44(46.32%) patients were prescribed with ACE inhibitors and calcium channel blockers respectively. 37.89% of patients were prescribed with beta blockers while 18.95% of patients were given diuretics. 94.12% patients of hypertension co-morbid with ischemic heart disease(IHD) were prescribed with beta blockers while 58.82% and 47.66% were prescribed with diuretics and ACE inhibitors. 35.29% and 23.53% of cases were prescribed with calcium channel blockers and angiotensin receptor blockers. All 3 patients of hypertension co-morbid with congestive heart failure (CHF) were prescribed with ACE inhibitors and diuretics. Two of them were prescribed beta blockers.(Table 5, Figure 5)

Table 5: Commonly Used Antihypertensive Group in Study Patients

Antihypertensive group	No. of patients of hypertension alone (N=235)	No. of patients hypertension co- morbid DM (N=95)	No. of patients hypertension co-morbid with IHD (N=17)	No. of patients hypertension co-morbid with CHF (N=3)	No. of patients (%) N=350
ACE-inhibitors	77 (32.77%)	57 (60%)	8 (47.06%)	3 (100%)	145 (41.43%)
Beta blocker	102 (43.40%)	36 (37.89%)	16 (94.12%)	2 (66.67%)	156 (44.57%)
Calcium channel blocker	138 (58.72%)	44 (46.32%)	6 (35.29%)	0 (0.00%)	188 (53.71%)
Angiotensin receptor blocker	61 (25.96%)	14 (14.74%)	4 (23.53%)	0 (0.00%)	79 (22.57%)
Diuretic	72 (30.64%)	18 (18.95%)	10 (58.82%)	3 (100%)	103 (29.43%)
Alpha 2 agonist	6 (2.55%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	6 (1.71%)

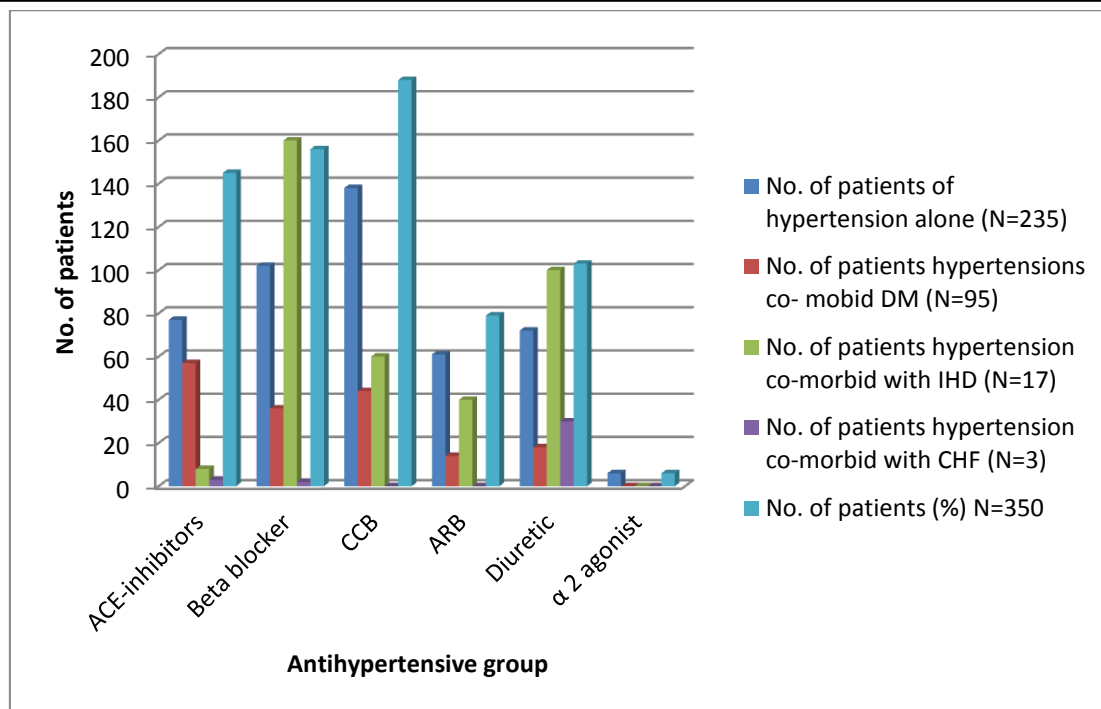


Figure: 5 Commonly used antihypertensive group in study patients., Calcium channel blockers were the most commonly prescribed antihypertensive group (53.71%) and Alpha agonist (1.71%) was the least prescribed antihypertensive group.

Fixed Dose Drug Combination (Fdc) Antihypertensive Prescribed

Out of 350 patients, 138 (39.42%) were prescribed fixed-dose drug combination. Six patients

received two FDCs and these six patients were of hypertension alone. So a total of 144 FDCs was prescribed. (Table6, Figure 6.)

Table 6 Fixed dose drug combination antihypertensive prescribed

	Hypertension Alone	Hypertension Co-morbid with Diabetes Mellitus	HTN+ IHD	HTN+ CHF	Total FDCs
No of FDCs	116	22	6	0	144

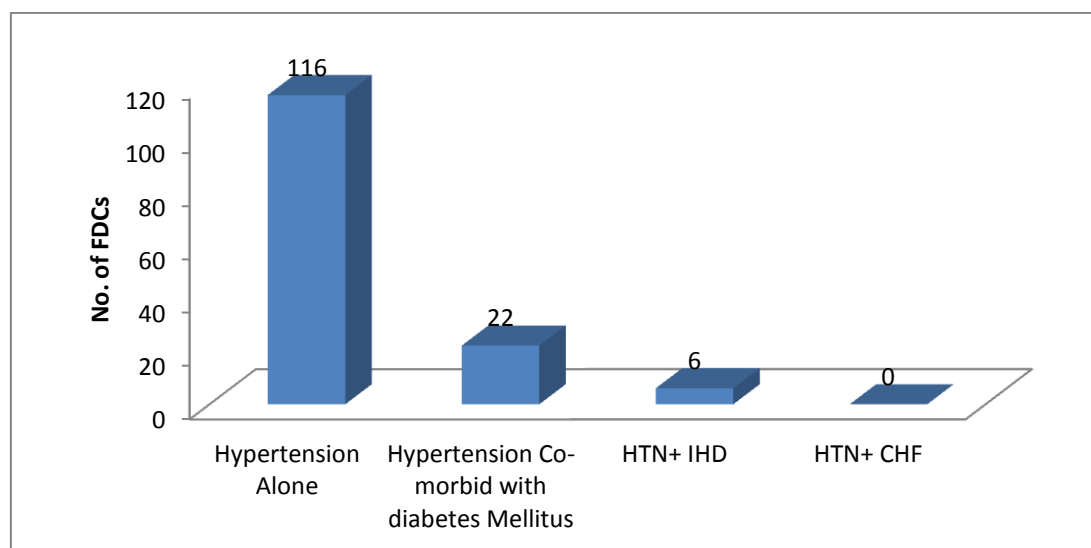


Figure: 6 Fixed Dose Drug Combination (FDC) Antihypertensive Prescribed. Maximum number of FDCs were prescribed for hypertension alone followed by hypertension with diabetes.

Types of Fixed Dose Combinations

Total nine types of FDCs have been prescribed to the patients. Four of them were containing hydrochlorothiazide as one component while another drug was losartan, telmisartan, valsartan, and enalapril respectively. Rest of the FDCs contained beta blocker as one component – two

contained metoprolol and one had atenolol. Atenolol + amlodipine FDC was the most commonly used FDC (40.28%) followed by amlodipine + metoprolol (22.22%) and losartan + hydrochlorothiazide (13.19%). Telmisartan+ amlodipine was the least prescribed FDC (.69%) shown in table7 and figure7.

Table 7 Type of Fixed-dose drug combination antihypertensive prescribed

Types of FDC	No. of FDCs	Percentage
Atenolol+amlodipine	58	40.28
Enalapril+hydrochlorthiazide	10	6.94
Losartan+hydrochlorthiazide	19	13.19
Metoprolol+amlodipine	32	22.22
metoprolol+ramipril	6	4.17
Telmisartan+hydrochlorthiazide	13	9.03
Telmisartan+amlodipine	1	0.69
Telmisartan+chlorthalidone	3	2.08
Valsartan+hydrochlorthiazide	2	1.39
Total	144	100

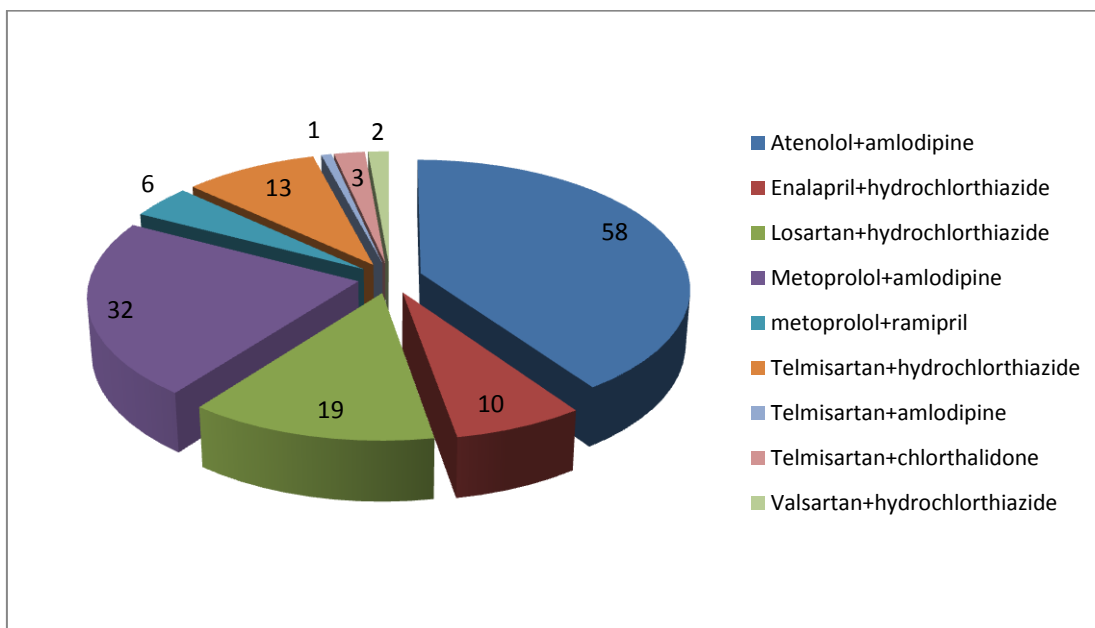


Figure 7: Type of Fixed-dose drug combination antihypertensive prescribed. Most common FDC drug prescribed was Atenolol+Amlodipine followed by Metoprolol+Amlodipine.

Discussion

Hypertension is a chronic disease requiring lifelong treatment. Although lifestyle modifications play an important role in hypertension management, drugs become unavoidable in many patients.

In our study, 34.85 % of patients were stabilized on monotherapy. A study conducted by Pai et al¹¹ reported monotherapy in 49 % of hypertensive patients. While Etuk et al¹² found monotherapy was used only in 20% cases of hypertension.

Majority of our patients (65.15%) were on multiple drug therapy. There is a favorable disposition to combination therapy in recent years particularly in patients with more difficult to control BP (often encountered in tertiary or referral settings).¹³ There is a rational justification for such therapy because the multifactorial nature of hypertension is addressed, BP control and achievement of target BP tends to be better, and the risk of side effects owing to use of maximal doses of mono therapeutic agents is reduced.

In our study, the average number of antihypertensive drugs in hypertension alone was (1.94) and an average number of antihypertensive drugs in comorbid IHD cases was (2.52). In hypertension co-morbid with DM, an average number of antihypertensive (1.77). This may be explained by 4.25% and 11.76% cases of hypertension alone and with IHD have been prescribed four antihypertensive drugs while a maximum number of antihypertensive prescribed to comorbid DM cases was two. An average number of antihypertensive is high in co-morbid CHF and IHD cases which were more than 2.5 in each condition. It seems reasonable because hypertension comorbid with these conditions is difficult to treat and require multiple drug therapy. All cases of these patients received two or more than two antihypertensive drugs.

In this study, ACE inhibitors were found the most commonly (60%) prescribed antihypertensive group in patients of diabetic hypertensive. This finding is in consonance with the a study by Sandozi and Emani¹⁴ who reported 50% of diabetic hypertensive patients were on ACE-inhibitors. In this study, all cases of hypertension with CHF ACE inhibitors were prescribed. Jackson¹⁵ also found ACE inhibitors were prescribed in 74.70% of cases of hypertension with CHF cases. Several large, randomized trials of participants with nondiabetic kidney disease determined that regimens including ACE inhibitors are more effective in reducing the occurrence of kidney endpoints compared to regimens not including ACE inhibitors.¹⁶

Beta-blocker was the most commonly prescribed antihypertensive drug group (94.12%) in hypertensive IHD cases. Beta-blockers improve survival in patients of CHF cases and this is due to antagonism of ventricular wall enhancing, apoptosis promoting and pathological remodeling effects of the excess sympathetic activity.¹⁷

In this study, CCBs was the most commonly prescribed antihypertensive group (58.72%). Same results were found in QUADS study¹⁸ in which they reported CCB (65%) were the most commonly prescribed drugs. Pai et al¹¹ also found reported calcium channel blockers (49%) as the most commonly prescribed drugs. In our study, CCBs were found the most commonly prescribed group in diabetic hypertensive patients. Teemu Ahola found that beta blocker and ACE inhibitors were the leading class of drug in hypertension co-morbid with diabetes.¹⁹

In this study, thiazide diuretics were prescribed 18.28% of patients. Thiazide-type diuretics have been the basis of antihypertensive therapy in most outcome trials.²⁰ In these trials, including Antihypertensive and Lipid-Lowering Treatment to Prevent Heart Attack Trial (ALLHAT)²¹, diuretics have been virtually unsurpassed in preventing the cardiovascular complications of hypertension. The present study found, 39.42% of patients received fixed-dose combinations. FDCs containing beta blocker and CCB were found most commonly used. Amlodipine + atenolol was most commonly prescribed drug combination in 40.28% patients. These FDCs though are recommended by JNC- VIII guidelines²². Pai et al¹¹ found ARB with a diuretic (25.4%) was the most frequently prescribed two-drug combination which was not according to our study.

Conclusion

Hypertension and its complications can be control by diet, regular exercise, medicines and by time to time follow up. Most commonly prescribed drugs were CCB was most commonly prescribed drugs in this study and ACE inhibitors were most commonly prescribed in diabetic patients. While

most common prescribed antihypertensive drug in IHD patients was Beta blockers.

Limitations of the Study

The study populations size was small so it was not representative of the entire population, and the duration of the study was short.

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Conflict of Interest

The authors declare that no conflict of interest, financial or otherwise exists.

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