

Research Article

Drug Prescribing Pattern in Hypertension in General Medicine Department at a Tertiary Care Teaching Hospital – A Retrospective Medical Record Based Study

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ABSTRACT

Introduction: Hypertension is a major medical and public health issue. As the age group increases, so does the incidence and prevalence of hypertension. Therefore, to rationalize medical care and make it more cost-effective, medical practitioners can monitor, assess, and recommend suitable improvements to their prescribing patterns. Several guidelines have been developed worldwide for the management of chronic diseases. However, many clinicians practice their prescribing pattern in treating the patients according to their clinical experience.

Aim: The present study was conducted to evaluate the prescribing pattern for hypertension in the Department of General Medicine.

Materials and Methods: The data was collected from the medical records of hypertensive patients who had come to the General Medicine OPD. There was a total of 318 medical records from 1st September 2023 to 30th November 2023. The following parameters were collected and analyzed- Demographic details, associated co-morbidities, antihypertensive drug classes prescribed, common antihypertensive drugs prescribed under each class, number of fixed-dose combinations, prescriptions with generic names/brand names, and total number of drugs per prescription.

Results and Conclusion: From this study it can be concluded that, angiotensin receptor blockers (ARBs) are the commonly prescribed antihypertensive drug class. Among the ARBs, Telmisartan and Losartan are commonly prescribed. Fixed dose combination of Amlodipine and Atenolol is commonly prescribed. Compared to brand names, the majority of the prescriptions had generic names. Knowledge about rational prescribing of the drugs is extremely important among clinicians to prevent any untoward effect due to a drug.

Keywords: Hypertension, Prescribing pattern, Antihypertensives, Medical records

1. INTRODUCTION

Hypertension is defined as increased systolic blood pressure (SBP) ≥ 140 mm Hg and diastolic blood pressure (DBP) ≥ 90 mm Hg. 25% of the urban population and 10% of the rural population in India are diagnosed to be hypertensive. High blood pressure is one leading cause of increased cardiovascular morbidity. Hypertension is the fourth contributor and seventh contributor to premature deaths in developed and developing countries respectively [1]. Hypertension is a major medical and public health issue. As the age

group increases, so does the incidence and prevalence of hypertension. More than half of the population in the age group between 60 and 69 years and three-fourths of the population above 70 years suffer from hypertension and its co-morbidities [2]. The prevalence of hypertension in males is 24% which is slightly higher than in females (20%) [3]. 62% of strokes and 49% of myocardial infarctions have been attributed to increased risk of elevated blood pressure. Lifestyle modifications play a crucial role in the management of hypertension and in reducing

overall cardiovascular risk. Incorporating interventions such as a low-sodium diet, regular physical activity, weight reduction, smoking cessation, and moderation of alcohol intake can significantly enhance blood pressure control. [4]. It is found that even though 59% of the patients receive proper antihypertensive treatment, only 34% of the patients have controlled blood pressure. It is alarming to discover that 30% of the population is not aware that their blood pressure is on the higher side. Various classical antihypertensive drugs are prescribed like diuretics, angiotensin receptor blockers, angiotensin-converting enzyme inhibitors, calcium channels blockers, beta-blockers, and so on. Among these groups Angiotensin Receptor Blockers (ARBs) are considered as initial therapy in managing hypertension. Angiotensin receptor blockers (ARBs) exert their antihypertensive effect by selectively inhibiting the angiotensin II type 1 (AT) receptors, thereby preventing vasoconstriction, aldosterone secretion, and sympathetic activation—ultimately promoting vasodilation and cardiovascular protection without increasing bradykinin levels. Several recent studies have shown that ARBs are effective in the management of heart failure, nephropathy with and without diabetes. ARBs also significantly prevent the occurrence of new and recurrence of stroke. [5] Despite the efforts to curb hypertension, the number of hypertensive cases is estimated to increase by 15-20% in 2050 [3].

Polypharmacy is described by the situation wherein an individual is prescribed with multiple medications (use of 5 or more medicines concomitantly) [6]. Polypharmacy has seen an important increase in recent times which is attributed to an increase in life expectancy and an increase in various co-morbidities that require the administration of multiple drugs. Polypharmacy has multiple effects and it should be of concern to physicians and policymakers because it can cause a significant financial burden to the patients and lead to many medical consequences due to drug interactions [3]. Another burden due to polypharmacy is non-adherence which may not be intentional due to

the fact the majority of the patients with multiple medications are in the elderly age group who tend to forget more often [4]. However, polypharmacy as such is not harmful, provided the physician has the proper knowledge of the drug and its interactions. Inappropriate combination of drugs can lead to debilitating effects [7]. Healthcare professionals should be concerned about reducing the negative effects of polypharmacy like drug-drug interactions, non-adherence, adverse effects, and financial burden [8]. To rationalize medical care and make it more cost-effective, medical practitioners can monitor, assess, and recommend suitable improvements to their prescribing patterns. Furthermore, because pharmaceuticals use a significant number of resources, it is even more important to regularly monitor prescribing patterns and drug administration and to develop suitable corrective actions for errors found to ensure efficient use of the resources [9]. Evaluating prescribing patterns helps in a quality improvement process that seeks to improve patient care and outcomes through a systematic review of care against explicit criteria and the implementation of change. Several guidelines have been developed worldwide for the management of chronic diseases and these serve as reference standards for clinical practitioners. However, many clinicians practice their prescribing pattern in treating the patients according to their clinical experience [10]. This institution is a tertiary care hospital that meets the health needs of the majority of the population in and around Mangalore. So, the present study was done to evaluate the prescribing pattern for hypertension in the Department of General Medicine.

2. MATERIALS AND METHODS

A retrospective study was conducted at Yenepoya Medical College and Hospital, where the data was collected from the medical records of hypertensive patients who had come to the General Medicine OPD. All the medical records of the hypertensive patients from 1st September 2023 to 30th November 2023 were included. There was a total of 318 medical records. Institutional ethics committee clearance (Protocol Number- YEC2/2024/001) was

obtained before commencing the study. The following parameters were collected and analyzed- Demographic details, associated co-morbidities, antihypertensive drug classes prescribed, common antihypertensive drugs prescribed under each class, number of fixed-dose combinations, prescriptions with generic names/ brand names, and total number of drugs per prescription. Current Index of Medical Specialities (CIMS manual Jan-Apr 2025 edition) was used to identify different brand names of antihypertensive drugs. The identity of the patients and the prescribing doctors were kept strictly confidential.

2.1 Inclusion criteria

The study includes medical records of hypertensive patients, hypertension with diabetes type 2, and hypertension with other co-morbidities (hypothyroidism, bronchial asthma, coronary artery disease) in the department of general medicine with at least one drug prescribed in their drug chart.

2.2 Exclusion criteria

Medical records with no diagnosis and illegible medical records were excluded from the study.

2.3 Statistical analysis

Data obtained was analyzed using IBM SPSS Statistics V.30.

3. RESULTS & DISCUSSION

3.1 Demographic details

The prescription data was collected from 318 medical records of the hypertensive patients. There were 145 male and 173 female patients. The mean age of the patients was calculated to be 53.6 years.



Figure 1 Demographic details

Out of the total number of patients, 124 patients had type 2 diabetes mellitus associated with hypertension, 66 patients had other co-

morbidities like, hypothyroidism, bronchial asthma and coronary artery disease. 128 hypertensive patients had no associated co-morbidities [Figure - 1 and 2].

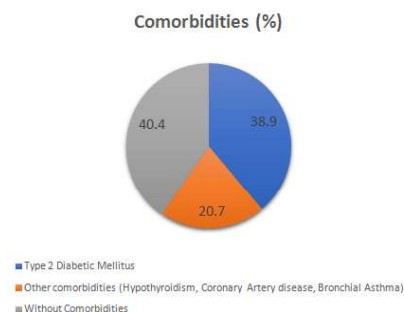


Figure 2 Comorbidities

3.2 Drugs classes and drugs prescribed under each class

Commonly prescribed antihypertensive drug classes and drugs under each class are represented in Table 1.

Table 1 Drug classes and drugs prescribed under each class

Drug Class	Drugs (No.)	Percentage (%)
Angiotensin Receptor Blockers (ARBs)	Lorsartan (45)	32.3
	Telmisartan (58)	
Beta blockers (β blockers)	Atenolol (34)	14.7
	Metoprolol (07)	
	Nebivolol (06)	
Calcium channel blockers (CCB)	Amlodipine (40)	12.6
Angiotensin converting enzyme (ACE)	Ramipril (37)	16.6
	Enalapril (16)	
Fixed drug combination (FDC)	Amlodipine + Atenolol (32)	23.6
	Amlodipine + Hydrochlorothiazide (5)	
	Telmisartan + Hydrochlorothiazide (13)	
	Losartan + Hydrochlorothiazide (16)	
	Ramipril + Hydrochlorothiazide (09)	

3.3 Prescriptions with generic names Vs brand names

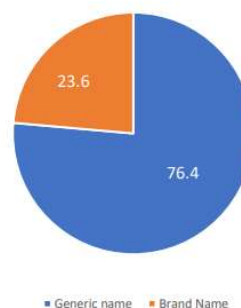


Figure 3 Prescriptions with generic names Vs brand names

Among the analyzed medical records, 243 records had drugs prescribed in generic name and 75 records had drugs prescribed in brand names [Figure 3].

3.4 Number of drugs per prescription

Number of drugs given in each prescription is shown in Table 2

Table 2 Total number of drugs per prescription

No. of drugs per prescription	Total No. (%)
3 drugs	54 (16.9)
4 drugs	75 (23.5)
5 drugs	118 (37.1)
7 drugs	29 (9.1)
8 drugs	24 (7.5)
9 drugs	18 (5.6)

3.5 Discussion

The objectives of the study were to evaluate the prescription pattern of hypertensive patients with respect to the commonly prescribed antihypertensive drug classes, commonly prescribed antihypertensive drugs and to identify the prevalence of polypharmacy. Analyzing prescribing patterns of antihypertensive medications allows clinicians and researchers to evaluate adherence to evidence-based guidelines, identify gaps in treatment selection or intensity, and correlate these with blood pressure control rates—thereby guiding quality improvements in hypertension management [11]. Hypertension has become a major public health problem in the entire world. It is a major cause of various debilitating diseases like renal failure, myocardial infarction, stroke and so on. There has been an increase in the number of hypertensive patients in the past years in developing countries. Prevalence of hypertension increases as age advances. A systematic review done in Iran has shown that prevalence of hypertension is more in people whose age is more than 55 years. Also the cases were seen more in women compared to men [12]. A national cross-sectional study in India has stated that prevalence of hypertension is more in men compared to women. Less cases of hypertension are seen in younger individuals [13]. In this study, number of females with hypertension was more compared to males.

Hypertension commonly occurs alongside comorbid conditions such as diabetes mellitus, chronic kidney disease, and coronary artery disease, all of which contribute to an elevated risk of cardiovascular morbidity and mortality. These comorbid conditions necessitate individualized treatment approaches to ensure optimal blood pressure control and end-organ

protection [14]. A Canadian study has shown that hypertensive patients who are above 35 years with no cardiovascular diseases are suffering from other morbidities like obesity, hyperlipidaemia and diabetes [15]. It is said that in more than 50% of older adults suffer from multiple chronic diseases in developed countries. Co morbidity is notable status which is associated with increased complexity of healthcare [16]. In our study, majority of the patients had associated co morbidities with association of diabetes mellitus being the highest. A previous drug utilization study on antihypertensive drugs has shown that angiotensin receptor blocker (ARB) was the commonest group prescribed followed by angiotensin converting enzyme inhibitor (ACE inhibitor). Losartan which is an angiotensin receptor blocker was the most common drug prescribed as monotherapy [17]. Angiotensin receptor blockers (ARBs) are increasingly utilized as first-line antihypertensive agents due to their ability to effectively lower blood pressure with once-daily dosing, offer cardiovascular and renal protection comparable to ACE inhibitors, and demonstrate a more favorable tolerability profile—marked by significantly lower rates of cough and angioedema—especially in patients intolerant to ACE inhibitors [18]. Another study conducted in a South Indian tertiary care hospital by Suprattim Dutta concluded that calcium channel blockers were commonly prescribed followed by ACE inhibitors/ ARBs and beta blockers. In terms of drugs, amlodipine was the commonly prescribed drug followed by atenolol and enalapril [19]. In our study, Telmisartan was the commonly prescribed drug followed by Losartan, Amlodipine, Ramipril and Atenolol. In terms of drug classification, ARBs were more common followed by ACE inhibitors, beta blockers and calcium channel blockers.

Fixed Dose Combinations (FDCs) have been shown to increase the medication adherence in hypertensive patients. Several studies have been successful in demonstrating the safety and efficacy of triple and quadruple combinations of antihypertensive drugs. Antihypertensive FDCs help manage patients with non-adherence and high pill burden [20]. A Canadian study also

claimed that patients taking single pill antihypertensives had less association with other diseases like myocardial infarction, stroke owing to increased medication adherence [21]. Enalapril which is an angiotensin converting enzyme inhibitor is often combined with amlodipine which is a calcium channel blocker, followed by a combination of enalapril, atenolol (beta blocker) and furosemide (loop diuretic) [17]. A study done by Takayuki Ishida et al has shown that FDC of an ARB with a diuretic is common in Japan compared the combination of an ARB with a calcium channel blocker [22]. In our study 23.6% of the patients were prescribed with FDCs. A calcium channel blocker and a beta blocker were combined in majority of the patients followed by the combination of a calcium channel blocker with a thiazide diuretic. The generic name of a drug refers to its standardized, nonproprietary designation that identifies the active pharmaceutical ingredient, while the brand name is a proprietary, trademarked label assigned by a manufacturer for marketing purposes; although both contain the same active substance, brand-name drugs are often more expensive, despite generics demonstrating equivalent efficacy and safety profiles [23]. There are numerous generic versions of antihypertensive medications that are significantly less expensive than their name-brand equivalents. A generic drug is the one which is comparable to brand drugs in terms of dosage form, strength, and route of administration, quality, performance and intended use. The companies which manufacture the generic drugs should demonstrate that their product has similar bioequivalence to the branded counterparts. It has been argued that some generic drugs are available in different salt form than the innovator drug. Amlodipine is available as amlodipine besylate as the innovator drug whereas amlodipine maleate is the generic formulation. In this case, bioequivalence studies are not sufficient to demonstrate the long-term efficacy in blood pressure lowering effect [24]. Since generic drugs are bioequivalent to the brand drugs and are much cheaper, they have been introduced in various countries for hypertensive management to improve

medication adherence. Systematic reviews and meta-analysis studies have shown that there is no considerable evidence to prove the efficacy of brands over generic drugs and vice versa. However, there is concern which exists among doctors and patients regarding the efficacy of generic antihypertensive agents [25]. In our study 76.4% of the patients were prescribed with generic drugs and 23.6% were prescribed with branded drugs.

Polypharmacy, as defined by the World Health Organization, is the administration of many medications at the same time or an excessive number of medications. Continuous polypharmacy corresponds to the situation when medications are used for an extended period of time. Drug–drug interactions are a concern with polypharmacy especially in elderly population with multiple co morbidities. Reports suggest that adverse effects due to drug-drug interactions increase by 50% in patients taking more five medications simultaneously. Many hypertensive patients require more than one or two antihypertensive medications to maintain the target blood pressure due to associated co morbidities. Elderly individuals taking multiple antihypertensive medications are more vulnerable to drug-drug interactions leading to many untoward effects [26]. In our study 23.6% of the population was taking combinations of two antihypertensive drugs. 54% of the patients had minimum three drugs prescribed and 18% of the patients had a total of nine drugs prescribed. Moreover, Antihypertensive medications, while effective in lowering blood pressure, are frequently associated with class-specific adverse effects. Diuretics can cause electrolyte imbalances such as hypokalemia, while ACE inhibitors are known for inducing a dry cough and, rarely, angioedema. Calcium channel blockers often result in peripheral edema, and beta-blockers may lead to fatigue and bradycardia. Recognizing and managing these side effects is essential for improving patient adherence and therapeutic outcomes [27].

Limitations of the study

1. Data was obtained from a limited number of medical records over a limited period of time

(318 medical records for a period of 3 months).

2. Prescriber category was not taken into consideration while selecting the medical records (Junior/Senior residents, Assistant/Associate Professors, Professors).

4. CONCLUSION

From this study it can be concluded that, angiotensin receptor blockers (ARBs) are the commonly prescribed antihypertensive drug class. Among the ARBs, Telmisartan and Losartan are commonly prescribed. Fixed dose combination of Amlodipine and Atenolol is commonly prescribed. Compared to brand names, the majority of the prescriptions had generic names. More than 50% of the patients have other co morbidities, hence prescribed with multiple drugs. A more rational approach to prescribing is observed in the present study. Knowledge about rational prescribing of the drugs is extremely important among clinicians to prevent any untoward effect due to a drug.

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Conflict of Interest

We wish to confirm that there are no known conflicts of interest associated with this publication and there has been no significant financial support for this work that could have influenced its outcome.

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This is a self-funded research study.

Ethical Information

Approval from the Institutional Ethics Committee (Protocol No.- YEC2/2024/001) was obtained prior to the commencement of the study.

REFERENCES:

1. Sinha DP, Kumar A, Sinha KK. Study of prescription pattern of antihypertensive drugs in a tertiary care hospital. *Int j acad med pharm.* 2024; 6(4):1079-82.
2. Chobanian AV, Bakris GL, Black HR, Cushman WC, Green LA, Izzo Jr JL, Jones DW, Materson BJ, Oparil S, Wright Jr JT, Roccella EJ. Seventh report of the joint national committee on prevention, detection, evaluation, & treatment of high blood pressure. *Hypertension.* 2003;42(6):1206-52.
3. Diaconu CC, Cozma MA, Dobrică EC, Gheorghe G, Jichitu A, Ionescu VA, Nicolae AC, Drăgoi CM, Găman MA. Polypharmacy in the management of arterial hypertension-friend or foe?. *Medicina.* 2021; 57(12): 1288.
4. Raju S, Solomon S, Joseph AC. Assessment of prescribing pattern for hypertension and comparison with JNC-8 guidelines-proposed intervention by clinical pharmacist. *Journal of Young Pharmacists.* 2016; 8(2): 133.
5. Chrysant SG, Chrysant GS. The pleiotropic effects of angiotensin receptor blockers. *Curr Hypertens Rep.* 2006; 8(5): 343-49.
6. Davies LE, Spiers G, Kingston A, Todd A, Adamson J, Hanratty B. Adverse outcomes of polypharmacy in older people: systematic review of reviews. *Journal of the American Medical Directors Association.* 2020; 21(2): 181-7.
7. Paramba T, Zilate S. Correlation between Polypharmacy and Health-Related Quality of Life in Patients of Hypertension. *J. Res. Med. Dent. Sci.* 2022; 10(12): 225-9.
8. Alsanosi SM, Mousa AH, Ahmadini HA, Qadhi RS, Ikram N, Felemban AH, Alqashqri HS, Hariri NH, Alhindi YZ, Ayoub N. Polypharmacy among patients with hypertension attending primary healthcare centres. *Annals of Medicine and Surgery.* 2023; 85(6): 2545-9.
9. Pandey AA, Thakre SB, Bhatkule PR. Prescription analysis of pediatric outpatient practice in Nagpur city. *Indian Journal of Community Medicine.* 2010; 35(1): 70-3.
10. Jarari N, Rao N, Peela JR, Ellafi KA, Shakila S, Said AR, Nelapalli NK, Min Y, Tun KD, Jamallulail SI, Rawal AK. A review on prescribing patterns of antihypertensive drugs. *Clinical hypertension.* 2015; 22: 1-8.

11. Yazie TS, Yimer YS, Belete AM, Desta GT. Prescribing pattern of anti-hypertensive medications among hypertensive outpatients at selected hospitals of South Gondar Zone, Amhara, Ethiopia: A hospital-based cross-sectional study. *Integr Pharm Res Pract.* 2020; 9: 65–72.
12. Khajedaluee M, Hassannia T, Rezaee A, Ziadi M, Dadgarmoghaddam M. The prevalence of hypertension and its relationship with demographic factors, biochemical, and anthropometric indicators: A population-based study. *ARYA atherosclerosis.* 2016; 12(6): 259.
13. Chakraborty S, Ussatayeva G, Ming-Shinn L, Dalal K. Hypertension: a national cross-sectional study in India. *Turk Kardiyoloji Dernegi Arsivi.* 2022; 50(4): 276.
14. Wang J, Ma JJ, Liu J, Zeng DD, Song C, Cao Z. Prevalence & risk factors of comorbidities among hypertensive patients in China. *Int J Med Sci.* 2021; 18 (6): 1434–43.
15. Schmieder RE, Ruilope LM. Blood pressure control in patients with comorbidities. *The Journal of Clinical Hypertension.* 2008; 10(8): 624-31.
16. Noh J, Kim HC, Shin A, Yeom H, Jang SY, Lee JH, Kim C, Suh I. Prevalence of comorbidity among people with hypertension: the Korea National health and nutrition examination survey 2007-2013. *Korean circulation journal.* 2016; 46(5): 672-80.
17. Radhika AR. Drug utilization study of antihypertensive drugs in a tertiary care hospital. *Int. J. Basic Clin. Pharmacol.* 2018; 7(12): 2309-13.
18. Chrysant SG. Reappraisal of role of angiotensin receptor blockers in cardiovascular protection. *Vasc Health Risk Manag.* 2009; 5: 317–24.
19. Datta S. Utilization study of antihypertensives in a South Indian tertiary care teaching hospital and adherence to standard treatment guidelines. *Journal of basic & clinical pharmacy.* 2016; 8(1):z33-37.
20. O'Hagan E, McIntyre D, Nguyen T, Tan KM, Hanlon P, Siddiqui M, et al., A Cross Sectional Survey of Fixed-Dose Combination Antihypertensive Medicine Prescribing in Twenty Four Countries, Including Qualitative Insights. *Global Heart.* 2024; 19(1): 73.
21. Verma AA, Khuu W, Tadrour M, Gomes T, Mamdani MM. Fixed-dose combination antihypertensive medications, adherence, and clinical outcomes: a population-based retrospective cohort study. *PLoS medicine.* 2018; 15(6): e1002584.
22. Ishida T, Oh A, Nishigaki N, Tsuchihashi T. Treatment patterns of antihypertensive fixed-dose combinations according to age and number of agents prescribed: Retrospective analysis using a Japanese claims database. *Geriatrics & Gerontology International.* 2019; (11):1077-83.
23. Kesselheim AS, Misono AS, Lee JL, Stedman MR, Brookhart MA, Choudhry NK, Shrank WH. Clinical equivalence of generic and brand-name drugs used in cardiovascular disease: A systematic review and meta-analysis. *JAMA.* 2008; 300(21): 2514–26.
24. Cooper-DeHoff RM, Elliott WJ. Generic drugs for hypertension: are they really equivalent?. *Current hypertension reports.* 2013; 15: 340-5.
25. Zhang SY, Tao LY, Yang YY, Kong T, Wu CJ, Wang Y, Chen JZ, Song L, Wang YB, Hui RT, Zhang WL. Evaluation of blood pressure lowering effect by generic and brand-name antihypertensive drugs treatment: a multicenter prospective study in China. *Chinese Medical Journal.* 2021; 134(03): 292-301.
26. Aroojia A, Tabassuma F, Naeemb M, Sadiqaa Z, Mazhera M, Zahida T et al., Hypertension and polypharmacy: Identifying and mitigating drug-drug interaction risks. 2024; 18(5): 336-65.
27. King, Christ & Kumar, Dau & Daupadi, Mudi & Mudiyanse, Bam & Bond, Devid. Comprehensive Review of Antihypertensive Medications: Mechanisms, Indications, Adverse Effects, and Monitoring. 2024.