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RESEARCH ARTICLE

Evaluation of Antihypertensive Prescribing Patterns and Adherence to JNC-8 Guidelines at a Tertiary Care Teaching Hospital

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Abstract: Hypertension remains one of the main causes to cardiovascular morbidity and mortality globally. The main of this work is to assess the antihypertensive prescribing practices and their conformity to established guidelines at a tertiary care hospital in Kalaburagi, India. A nine-month, prospective observational study carried out in 323 hypertensive inpatients admitted to the Department of Medicine. Data analysis focused on demographic profiles, hypertension classification according to the 8th Joint National Committee (JNC-8) guidelines, and prescribed therapeutic regimens. The results indicated a male predominance (58.51%) among participants, with the 61–70 year age group exhibiting the highest prevalence (27.55%). According to JNC-8 criteria, Stage 1 hypertension was the most frequent diagnosis (47.67%), followed by Stage 2 hypertension (34.36%). Monotherapy was the preferred therapeutic strategy (70.89%) over combination therapy (29.10%). Among single-drug regimens, the Angiotensin II Receptor Blocker (ARB) Telmisartan was the most prescribed agent (39.15%), followed by the Calcium Channel Blocker (CCB) Amlodipine (25.23%). The fixed-dose combination of Telmisartan and Amlodipine was the most common multi-drug regimen (50.00%). Diabetes mellitus was the most prevalent comorbidity (15.47%). The results from this study indicate that prescribing patterns largely align with JNC-8 guidelines, showing a clear preference for ARBs and CCBs. Periodic drug utilization evaluations are necessary to sustain rational pharmacotherapy in hypertensive management.

Keywords: Hypertension; Antihypertensive Agents; Prescribing Patterns; Drug Utilization; JNC-8

1. Introduction

Hypertension (HTN) is a chronic, non-communicable medical condition characterized by persistently elevated arterial blood pressure, clinically defined as a systolic blood pressure (SBP) of ≥ 140 mmHg and/or a diastolic blood pressure (DBP) of ≥90 mmHg [1]. It is a primary risk factor for cardiovascular morbidity and mortality, acting as a major contributor to ischemic heart disease, stroke, heart failure, and chronic kidney disease. Due to its often-asymptomatic progression until target organ damage occurs, it is frequently described as the "silent killer" [2]. Globally, the prevalence of hypertension is substantial, affecting an estimated 1.13 billion individuals. A significant portion of this burden, nearly two-thirds, resides in low- and middle-income countries (LMICs) [3]. The World Health Organization (WHO) has reported that elevated blood pressure is directly responsible for approximately 7.5 million deaths annually, accounting for 12.8% of all global mortality [4]. In India, the prevalence of hypertension is escalating, driven by epidemiological transitions that include rapid urbanization, lifestyle modifications, increased rates of obesity, and psychosocial stress. Current estimates suggest that nearly one in three Indian adults may be hypertensive, posing a significant public health challenge [5].

The primary goal of hypertension management is the reduction of cardiovascular risk and the prevention of target organ damage. This typically involves a combination of lifestyle modifications and pharmacological intervention [6]. Several major classes of antihypertensive agents are available, including thiazide-type diuretics, beta-blockers (β-blockers), calcium channel blockers (CCBs), angiotensin-converting enzyme inhibitors (ACEIs), and angiotensin II receptor blockers (ARBs), which can be utilized as monotherapy or in combination [6]. Clinical practice guidelines, such as those from the 8th Joint National Committee (JNC-8), the American Heart Association (AHA), and the National Institute for Health and Care Excellence (NICE), provide evidence-based recommendations for first-line agents. These guidelines generally advocate for the use of ARBs, ACEIs, CCBs, and thiazide diuretics

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as initial therapy for most patient populations [9, 10]. Despite the availability of effective therapies, achieving optimal blood pressure control in clinical practice can be challenging. This difficulty may arise from improper drug selection, patient non-adherence, or suboptimal prescribing patterns [7]. Drug utilization studies are essential pharmacoepidemiologic tools used to evaluate the appropriateness, effectiveness, and economic efficiency of prescribing practices within a healthcare system. They serve to identify deviations from standard treatment guidelines, promote the rational use of medicines, and help contain healthcare costs [8]. Given the high prevalence of HTN and the multitude of therapeutic options, periodic assessment of prescribing trends is crucial for improving therapeutic outcomes and ensuring adherence to evidence-based guidelines [11, 12]. Therefore, the objective of this study was to analyze the prescribing patterns of antihypertensive medications at a tertiary care hospital and to evaluate their conformity with established clinical management guidelines [13].

2. Materials and Methods

2.1. Study Design and Setting

A prospective, observational study was conducted in the Department of Medicine at Basaveshwar Teaching and General Hospital, Kalaburagi, Karnataka, India. This facility is a tertiary care teaching hospital serving a large, diverse patient population.

2.2. Study Period and Population

The study was conducted over a period of nine months, from January 2025 to June 2025. A total of 323 patients diagnosed with hypertension, who were admitted as inpatients to the Department of Medicine, were included. The study population comprised both newly diagnosed hypertensive patients and known hypertensive patients already receiving antihypertensive therapy.

2.3. Inclusion and Exclusion Criteria

2.3.1. Inclusion Criteria

Participants eligible for inclusion were adults (≥18 years) of either sex, diagnosed with essential hypertension based on clinical evaluation and JNC-8 criteria. All included patients provided written informed consent to participate.

2.3.2. Exclusion Criteria

Patients were excluded from the study if they were pregnant or lactating. Patients diagnosed with secondary hypertension (e.g., resulting from renal artery stenosis or pheochromocytoma) or those with incomplete medical records were also excluded. Patients who were unwilling to provide consent or who left the hospital against medical advice were not included in the final analysis.

2.4. Data Collection

Data were meticulously extracted from inpatient case sheets, medication charts, and discharge summaries using a pre-designed and validated data collection form. The parameters recorded for each patient included:

- Demographic details: Age and sex.
- Clinical information: Clinical history, diagnosis, and classification of hypertension according to JNC-8 guidelines.
- Therapeutic details: Type of therapy (monotherapy or combination therapy), class of antihypertensive drug(s), and specific agents prescribed.
- Comorbidities: Presence of associated co-morbid conditions.

2.5. Ethical Considerations

The study protocol (Approval No: IEC/HKE/OBS/JAN2025/11) received formal approval from the Institutional Ethics Committee (IEC) of HKES's Matoshree Taradevi Rampure Institute of Pharmaceutical Sciences, Kalaburagi. The research was conducted in strict adherence to the ethical principles outlined in the Declaration of Helsinki and the Indian Council of Medical Research (ICMR) guidelines. Written informed consent was obtained from each participant prior to data collection.

2.6. Data Analysis

All collected data were entered into Microsoft Excel 2019 for organization and analysis. Descriptive statistics were employed to summarize the data. Results pertaining to patient demographics, hypertension classification, prescribing frequencies, and comorbidities are presented as frequencies and percentages.

3. Results and Discussion

3.1. Demographic Profile

A total of 323 hypertensive patients admitted during the study period met the inclusion criteria. Of these, 189 (58.51%) were male, and 134 (41.48%) were female, indicating a male predominance in the study population.

Patients were categorized into age groups ranging from 21 to >70 years. The highest prevalence of hypertension was observed in the 61–70 year age group, which included 89 patients (27.55%). This was followed by the 51–60 year (n=74, 22.90%) and 41–50 year (n=59, 18.26%) age groups. The lowest prevalence was noted in the 21–30 year age group (n=14, 4.33%), suggesting a strong correlation between advancing age and hypertension prevalence.

Table 1. Age and Gender Distribution of Hypertensive Patients (n=323)

Demographic Parameter	Category	Number of Patients (n)	Percentage (%)
Gender	Male	189	58.51%
	Female	134	41.48%
Age Group (Years)	21–30	14	4.33%
	31–40	32	9.91%
	41–50	59	18.26%
	51–60	74	22.90%
	61–70	89	27.55%
	>70	55	17.02%
Total		323	100.00%

3.2. Classification of Hypertension

Based on the JNC-8 diagnostic criteria, Stage 1 Hypertension was the most common classification identified, accounting for 154 patients (47.67%). Stage 2 Hypertension was the second most frequent, diagnosed in 111 patients (34.36%). Prehypertension (SBP 120–139 mmHg or DBP 80–89 mmHg) was identified in 58 patients (17.95%).

Table 2. Classification of Hypertension based on JNC-8 Guidelines (n=323)

JNC-8 Classification	Number of Patients (n)	Percentage (%)
Prehypertension	58	17.95%
Stage 1 Hypertension	154	47.67%
Stage 2 Hypertension	111	34.36%
Total	323	100.00%

3.3. Patterns in Antihypertensive Therapy

Analysis of the prescriptions revealed that a total of 582 antihypertensive drugs were prescribed to the 323 patients, yielding an average of 1.80 drugs per prescription.

Table 3. Prescribing Pattern of Antihypertensive Therapy (n=323)

Type of Therapy	Number of Patients (n)	Percentage (%)
Monotherapy	229	70.89%
Combination Therapy	94	29.10%
Total	**323**	**100.00%**

Monotherapy was the predominant therapeutic strategy, utilized in 229 patients (70.89%). Combination therapy, involving two or more antihypertensive agents, was prescribed for the remaining 94 patients (29.10%).

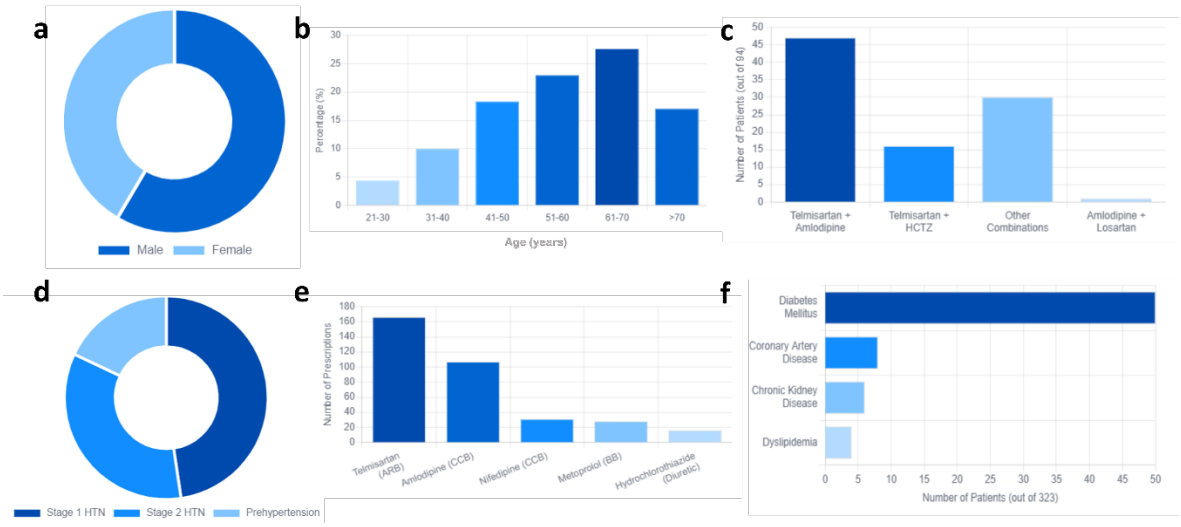

Figure 1. a. Gender Distribution b. Prevalence by Age Group c. Combination Therapy d. JNC-8 Hypertension Classification e. Most Prescribed agents f. Prevalence of Comorbidities

3.4. Analysis of Prescribed Drugs

3.4.1. Monotherapy

Among the 229 patients receiving monotherapy, the Angiotensin II Receptor Blocker (ARB) Telmisartan was the most frequently prescribed agent, accounting for 166 patients (39.15% of all prescriptions, adjusted for monotherapy share). The Calcium Channel Blocker (CCB) Amlodipine was the second most common single agent, prescribed to 107 patients (25.23%).

Other monotherapy agents were prescribed less frequently: Nifedipine (n=31, 7.31%), the β-blocker Metoprolol (n=28, 6.60%), and the thiazide diuretic Hydrochlorothiazide (n=16, 3.77%). A small number of patients received other agents like Ramipril, Nebivolol, Olmesartan, Bisoprolol, and Labetalol, each accounting for less than 1% of prescriptions.

Table 4. Prescribing Pattern of Monotherapy Regimens (n=229)

Drug (Monotherapy)	Number of Patients (n)	Percentage of Monotherapy (%)
Telmisartan	90	39.15%
Amlodipine	58	25.23%
Nifedipine	17	7.31%
Metoprolol	15	6.60%
Hydrochlorothiazide	9	3.77%
Others	4	1.55%
Total	**193**	**84.3%**

3.4.2. Combination Therapy

In the 94 patients receiving combination therapy, the fixed-dose combination of Telmisartan (ARB) + Amlodipine (CCB) was the most prevalent regimen, prescribed to 47 patients (50.00% of all combinations). The second most common pairing was Telmisartan (ARB) + Hydrochlorothiazide (diuretic), used in 16 patients (17.00%). A small fraction of patients (n=1, 1.06%) received a combination of Amlodipine + Losartan.

Table 5. Most Common Combination Therapy Regimens (n=94)

Drug Combination	Number of Patients (n)	Percentage of Combinations (%)
Telmisartan + Amlodipine	47	50.00%
Telmisartan + Hydrochlorothiazide	16	17.02%
Amlodipine + Losartan	1	1.06%
Other Unspecified Combinations	30	31.92%
Total	**94**	**100.00%**

3.5. Associated Comorbidities

The analysis of associated comorbid conditions revealed that Diabetes Mellitus was the most prevalent, present in 50 patients (15.47%). Other significant comorbidities identified included Coronary Artery Disease (CAD) (n=8, 2.47%), Chronic Kidney Disease (CKD) (n=6, 1.85%), and Dyslipidemia (n=4, 1.23%).

Table 6. Associated Comorbid Conditions in Hypertensive Patients (n=323)

Comorbidity	Number of Patients (n)	Percentage (%)
Diabetes Mellitus	50	15.47%
Coronary Artery Disease	8	2.47%
Chronic Kidney Disease	6	1.85%
Dyslipidemia	4	1.23%

4. Discussion

This study provided a detailed cross-section of antihypertensive prescribing practices within a tertiary care teaching hospital. The findings reflect adherence to contemporary guidelines and highlight specific regional prescribing preferences.

The observed male predominance (58.51%) in the hypertensive population aligns with findings from several other studies conducted in India [5, 6]. This may be attributable to a higher prevalence of lifestyle risk factors such as tobacco use, alcohol consumption, and chronic stress among males. The peak prevalence of hypertension in the 61–70 year age group (27.55%) is consistent with established epidemiological data [4]. Advancing age is a non-modifiable risk factor for hypertension, strongly correlated with vascular changes, including arterial stiffening and reduced elasticity.

The finding that Stage 1 Hypertension (47.67%) was the most common diagnosis, followed by Stage 2 (34.36%), is comparable to observations from other hospital-based studies [7, 8]. This diagnostic distribution justifies the high rate of monotherapy (70.89%) observed in this study. Guidelines, including JNC-8, recommend initiating therapy with a single agent for Stage 1 HTN, reserving combination therapy for Stage 2 HTN or for patients who fail to meet blood pressure targets on monotherapy [1, 14].

The most significant finding of this study is the pronounced preference for Telmisartan (an ARB) (39.15%) and Amlodipine (a CCB) (25.23%) as monotherapy agents. This pattern reflects a broader clinical trend favoring ARBs over ACE inhibitors. This preference is often attributed to the superior tolerability profile of ARBs, particularly the significantly lower incidence of persistent dry cough and angioedema, which are known adverse effects of ACEIs and a common reason for non-adherence [1]. Amlodipine remains a cornerstone of hypertension therapy due to its potent vasodilatory efficacy, long half-life, and general metabolic neutrality, making it a reliable choice, especially in older patient populations [9].

For patients requiring combination therapy, the selection of Telmisartan + Amlodipine (50.00%) is a rational, guideline-endorsed choice [5, 6]. This combination utilizes complementary mechanisms of action: blockade of the Renin-Angiotensin System (RAS) by Telmisartan and peripheral vasodilation by Amlodipine. This synergistic effect often leads to superior blood pressure control while mitigating the side effects of either agent alone (e.g., ARBs can reduce the peripheral edema associated with CCBs).

The high prevalence of Diabetes Mellitus (15.47%) as a comorbidity is a critical finding, as this patient population is at an exceptionally high risk for cardiovascular and renal complications [6, 8]. The JNC-8 guidelines specifically recommend ARBs or ACEIs for patients with hypertension and co-existing CKD [1]. The selection of Telmisartan, an ARB, in this population is highly appropriate, given the robust evidence supporting its nephroprotective and cardioprotective benefits in patients with diabetic nephropathy.

The overall prescribing pattern, emphasizing ARBs and CCBs as first-line agents, demonstrates strong adherence to the JNC-8 recommendations [1, 11]. However, a noteworthy discrepancy exists when compared to other international guidelines, such as those from NICE, which often recommend a thiazide-like diuretic as the initial agent for uncomplicated hypertension [9]. The very low use of Hydrochlorothiazide as monotherapy (3.77%) in this study may reflect local prescribing habits, physician concerns regarding potential metabolic side effects (e.g., hyperglycemia, dyslipidemia) associated with diuretics, or patient tolerability. This discrepancy highlights the value of periodic prescription audits to align clinical practice with the most current, comprehensive evidence.

5. Conclusion

This observational study of antihypertensive prescribing practices indicates that monotherapy, primarily with the Angiotensin II Receptor Blocker Telmisartan, was the most frequent therapeutic strategy. Amlodipine, a Calcium Channel Blocker, was the second most common choice. For patients requiring combination therapy, the Telmisartan-Amlodipine fixed-dose regimen was the main choice. These prescribing patterns demonstrate a high degree of adherence to JNC-8 guidelines, with a rational preference for ARBs and CCBs, particularly in the context of prevalent comorbidities like diabetes mellitus. The low utilization of thiazide diuretics represents a potential area for further evaluation and educational intervention. Continued medical education, interdisciplinary collaboration, and periodic drug utilization audits are essential to maintain rational pharmacotherapy and optimize therapeutic outcomes in the management of hypertension.

Compliance with ethical standards

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Conflict of interest statement

The authors declare that they have no conflict of interest.

Statement of ethical approval

The study protocol was reviewed and approved by the Institutional Ethics Committee (IEC) (Approval No: IEC/HKE/OBS/JAN2025/11) of HKES's Matoshree Taradevi Rampure Institute of Pharmaceutical Sciences, Kalaburagi, Karnataka, India. The research was conducted in accordance with the ethical principles outlined in the Declaration of Helsinki and the Indian Council of Medical Research (ICMR) guidelines for biomedical research involving human participants.

Statement of informed consent

Written informed consent was obtained from all individual participants included in the study.

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