

Antihypertensive Prescription Patterns and Blood Pressure Control in Patients With Hypertension At A Tertiary Care Hospital

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ABSTRACT

Background: Hypertension is a major contributor to cardiovascular and cerebrovascular morbidity and is frequently accompanied by metabolic and other cardiovascular risk factors. Although several effective antihypertensive drugs are available, adequate blood pressure control remains suboptimal in many patients. Evaluation of treatment patterns in routine clinical practice can provide useful information about commonly used antihypertensive regimens and the extent of blood pressure control.

Aim: To assess antihypertensive prescription patterns and blood pressure control among adults with established hypertension attending a tertiary-care hospital.

Methods: A cross-sectional observational study was conducted among 384 adults with known hypertension attending the Department of General Medicine, Sree Balaji Medical College and Hospital, Chennai. Patients aged ≥ 18 years who had been receiving stable antihypertensive treatment for at least one month were eligible. Newly diagnosed hypertensive patients and those receiving antihypertensive therapy irregularly were excluded. Demographic characteristics, associated comorbidities and antihypertensive treatment regimens were recorded. Patients were classified according to whether they received monotherapy, dual therapy or triple therapy. Blood pressure control was assessed using the criteria of the Eighth Joint National Committee (JNC 8).

Results: Of the 384 participants, 215 (56.0%) were males and 169 (44.0%) were females. Patients aged 51–60 years constituted the largest age group (36.0%). Monotherapy was prescribed in 154 (40.1%) patients, dual therapy in 134 (34.9%) and triple therapy in 96 (25.0%). Calcium channel blockers were the most frequently prescribed agents among patients receiving monotherapy. CCB + ARB was the most frequently observed dual-drug combination, while CCB + ARB + diuretic was the most frequently observed triple-drug regimen. Overall, 242 (63.0%) patients had controlled blood pressure and 142 (37.0%) had uncontrolled blood pressure. BP control was observed in 57.1% of patients receiving monotherapy, 64.2% receiving dual therapy and 70.8% receiving triple therapy. The difference in BP-control status across treatment-intensity groups was not statistically significant ($\chi^2=4.87$, $p=0.087$).

Conclusion: Combination antihypertensive treatment was frequently used in this tertiary-care population. Calcium channel blocker-containing regimens constituted an important component of antihypertensive prescribing. Although the proportion of patients with controlled BP was highest among those receiving triple therapy, the observed difference between treatment groups did not reach statistical significance.

Keywords: Hypertension; antihypertensive therapy; prescription pattern; blood pressure control; monotherapy; dual therapy; triple therapy; calcium channel blockers.

1. INTRODUCTION

Hypertension is among the most important modifiable determinants of cardiovascular disease worldwide. Persistent elevation of blood pressure is associated with increased risks of stroke, ischemic heart disease, heart failure and chronic kidney disease. Despite improvements in detection and availability of effective pharmacological treatment, BP control remains inadequate in a substantial proportion of patients. [1,2]

The management of hypertension commonly requires individualized selection of one or more antihypertensive agents. While some patients achieve adequate control with a single drug, others require combinations from different pharmacological classes. The choice of treatment may be influenced by age, baseline BP, duration of hypertension, associated cardiovascular risk factors, comorbidities, tolerability and physician preference.

The Indian population has a substantial burden of hypertension, and treatment and control patterns may differ from those observed in Western populations. Indian hypertension recommendations have therefore emphasized approaches appropriate to the country's healthcare environment and patient characteristics. [3]

Prescription-pattern studies can provide useful information regarding the actual treatment strategies used in routine clinical practice. In a study involving 2,100 patients from three South Indian hospitals, combination treatment was frequently used and calcium channel blockers were among the most commonly preferred antihypertensive agents. [4]

The India Hypertension Control Initiative has also demonstrated that organized systems for hypertension management can substantially improve BP control. In its cohort of more than 21,000 adults, the proportion of patients with controlled BP increased from 26.3% at registration to 59.8% at follow-up. [5]

Evidence from Indian systematic reviews demonstrates that BP control remains an important clinical challenge. A meta-analysis of 19 Indian studies involving 44,994 hypertensive individuals estimated BP control among treated patients at approximately 46%, although substantial geographic variation was observed. [6]

The present study was undertaken to describe antihypertensive prescribing patterns and determine the proportion of patients achieving BP control among adults with established hypertension attending a tertiary-care hospital in Chennai.

2. MATERIALS AND METHODS

2.1 Study design

A cross-sectional observational study was conducted among adult patients with established hypertension.

2.2 Study setting

The study was carried out in the Department of General Medicine, Sree Balaji Medical College and Hospital (SBMCH), Chennai, India.

2.3 Study population

The study included 384 adult patients with known hypertension who were receiving antihypertensive treatment.

2.4 Inclusion criteria

1. Age ≥ 18 years.
2. Previously diagnosed hypertension.
3. Receiving stable antihypertensive therapy for at least one month.

2.5 Exclusion criteria

1. Newly diagnosed with hypertension.
2. Taking antihypertensive medication irregularly.

2.6 Data collection

Information regarding age, sex, associated comorbidities and current antihypertensive treatment was recorded.

The antihypertensive regimen was classified as monotherapy, dual therapy or triple therapy. Individual drug classes and commonly used combinations were subsequently evaluated.

2.7 Assessment of BP control

BP control was categorized according to the treatment thresholds and targets described in the 2014 evidence-based JNC 8 guideline. [7]

2.8 Statistical analysis

Categorical variables were summarized as frequencies and percentages. The chi-square test was used to evaluate the association between treatment intensity and BP-control status. A two-sided p-value < 0.05 was considered statistically significant.

2.9 Ethical approval

The study was conducted following approval from the Institutional Ethics Committee, Sree Balaji Medical College and Hospital, Chennai.

3. RESULTS

3.1 Demographic characteristics

A total of 384 patients were included in the analysis. Males accounted for 215 (56.0%) participants and females for 169 (44.0%). The 51–60-year age group represented the largest proportion of the study population.

Table 1. Age distribution of study participants

Age group	Number	Percentage
<40 years	46	12.0
40–50 years	108	28.0
51–60 years	138	36.0
>60 years	92	24.0
Total	384	100.0

Age Distribution (n=384)

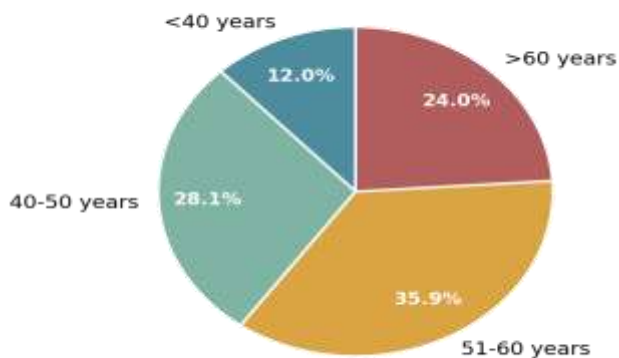


Figure 1. Age distribution of study participants (n=384)

Table 2. Sex distribution of study participants

Sex	Number	Percentage
Male	215	56.0
Female	169	44.0
Total	384	100.0

Sex Distribution (n=384)

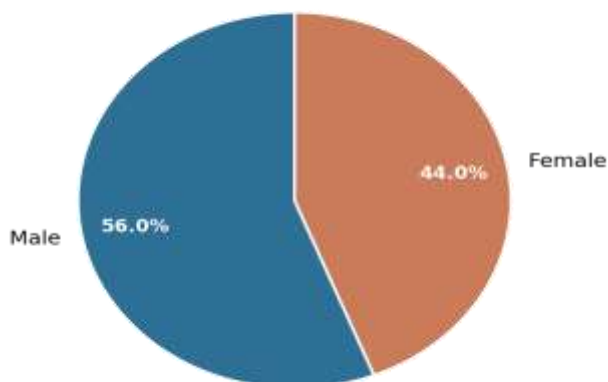


Figure 2. Sex distribution of study participants (n=384)

3.2 Comorbidity profile

The comorbidity categories were arranged as mutually exclusive patterns for the purpose of presentation.

Table 3. Distribution of comorbidity patterns among study participants

Comorbidity pattern	Number	Percentage
T2DM alone	52	13.5
T2DM + Dyslipidemia	78	20.3
T2DM + IHD	30	7.8
T2DM + CVA	15	3.9
T2DM + Dyslipidemia + IHD	79	20.6
CKD alone	11	2.9
No comorbidities	119	31.0
Total	384	100.0

Abbreviations: T2DM, type 2 diabetes mellitus; IHD, ischemic heart disease; CVA, cerebrovascular accident; CKD, chronic kidney disease.

3.3 Antihypertensive treatment intensity

Monotherapy was used in 154 (40.1%) patients. Dual therapy was prescribed in 134 (34.9%), while 96 (25.0%) patients received triple therapy. Overall, 230 (59.9%) participants were receiving combination antihypertensive treatment.

Table 4. Distribution according to treatment intensity

Treatment intensity	Number	Percentage
Monotherapy	154	40.1
Dual therapy	134	34.9
Triple therapy	96	25.0
Total	384	100.0

Treatment Intensity (n=384)

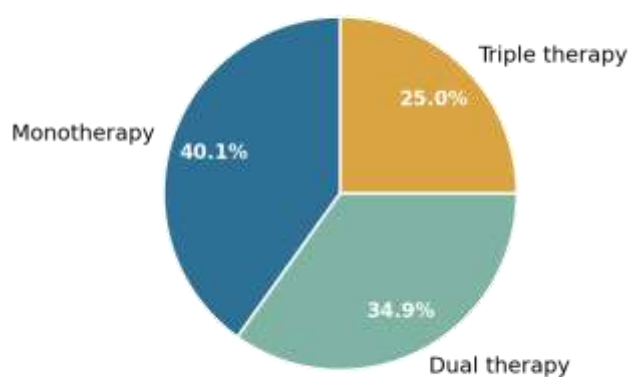


Figure 3. Distribution of antihypertensive treatment intensity (n=384)

3.4 Antihypertensive prescription pattern

Calcium channel blockers represented the largest group among the monotherapy prescriptions. Among two-drug regimens, CCB + ARB was the most frequently represented combination. Among triple-drug regimens, CCB + ARB + diuretic was the predominant combination.

Table 5. Distribution of antihypertensive regimens

Treatment category	Regimen	Number	% of total
Monotherapy	CCB	84	21.9
	ARB	42	10.9
	Beta blocker	28	7.3
Dual therapy	CCB + ARB	52	13.5
	CCB + beta blocker	34	8.9
	ARB + diuretic	28	7.3
	ARB + beta blocker	20	5.2
Triple therapy	CCB + ARB + diuretic	58	15.1
	CCB + beta blocker + diuretic	38	9.9
Total		384	100.0

Abbreviations: CCB, calcium channel blocker; ARB, angiotensin receptor blocker.

3.5 Blood pressure control

Of the 384 participants, 242 (63.0%) had controlled BP, whereas 142 (37.0%) remained uncontrolled. The proportion of controlled BP was 57.1% among patients receiving monotherapy, 64.2% among those receiving dual therapy and 70.8% among those receiving triple therapy.

Table 6. Blood pressure control according to treatment intensity

Treatment intensity	Controlled n (%)	Uncontrolled n (%)	Total
Monotherapy	88 (57.1)	66 (42.9)	154
Dual therapy	86 (64.2)	48 (35.8)	134
Triple therapy	68 (70.8)	28 (29.2)	96
Total	242 (63.0)	142 (37.0)	384

Overall BP Control (n=384)

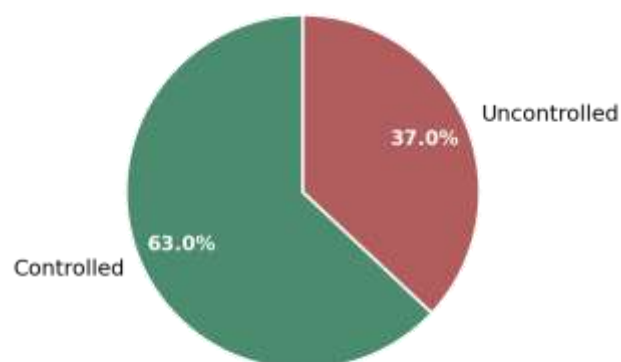


Figure 4. Overall blood pressure control status (n=384)

The difference in BP-control status across treatment groups was not statistically significant ($\chi^2=4.87$, $p=0.087$).

4. DISCUSSION

This study examined the antihypertensive treatment patterns and BP-control status of 384 adults receiving established treatment for hypertension at a tertiary-care hospital in Chennai.

The study population demonstrated a modest male predominance, while patients between 51 and 60 years constituted the largest age group. This age distribution is clinically relevant because hypertension and its associated cardiovascular risk factors become increasingly prevalent with advancing age.

A considerable proportion of participants had metabolic or cardiovascular comorbidities. The combination of T2DM and dyslipidemia represented an important comorbidity pattern in the study population. Such coexisting conditions are clinically relevant when selecting antihypertensive treatment because overall cardiovascular risk, renal function and associated indications may influence therapeutic choices.

More than half of the participants were receiving combination therapy. Dual therapy accounted for 34.9% of prescriptions and triple therapy for 25.0%, compared with 40.1% receiving a single antihypertensive agent.

The frequent use of combination treatment is consistent with previously reported prescribing patterns from South India. Sreedharan et al. studied 2,100 hypertensive patients across three South Indian hospitals and found that approximately half received monotherapy, while the remainder received combination treatment. Calcium channel blockers were among the most commonly preferred agents. [4]

In our study, CCB-containing regimens were prominent in both single-drug and combination treatment. The most frequent two-drug regimen was CCB + ARB, while CCB + ARB + diuretic was the most frequent triple-drug regimen. These findings provide an example of real-world prescribing patterns within a tertiary-care Indian setting.

Overall BP control was observed in 63.0% of the study population. This figure should be interpreted in the context of the selected study population, which consisted exclusively of patients with established hypertension who were already receiving stable antihypertensive treatment.

Indian population-level estimates are considerably lower. A systematic review and meta-analysis of 51 community-based studies involving more than 338,000 hypertensive individuals reported an overall hypertension-control rate of 17.5% during 2001–2020, increasing to 22.5% during 2016–2020. [8]

Similarly, a JIPMER-led systematic review of 19 Indian studies involving 44,994 hypertensive individuals found that BP control among patients receiving treatment was approximately 46%. [6]

The higher control rate observed in the present study may partly reflect the fact that the study population consisted of patients attending a tertiary-care hospital who were already receiving stable antihypertensive therapy. Direct comparison with community-based studies is therefore inappropriate without considering these differences in population and study design.

The India Hypertension Control Initiative provides further evidence that structured follow-up and standardized treatment strategies can improve BP control. Among patients returning for follow-up, BP control increased from 26.3% at registration to 59.8% at follow-up. [5]

In the present study, BP control increased numerically with treatment intensity: 57.1% with monotherapy, 64.2% with dual therapy and 70.8% with triple therapy.

However, this difference was not statistically significant ($\chi^2=4.87$, $p=0.087$).

Importantly, the result should not be interpreted as demonstrating that triple therapy is more effective than monotherapy or dual therapy. Patients prescribed more drugs may have had more difficult-to-control hypertension, greater cardiovascular risk or a higher burden of comorbid disease. Treatment allocation was not randomized, and therefore the study cannot establish a causal relationship between the number of antihypertensive agents and BP control.

The appropriate interpretation is that, within this study population, the proportion of patients with controlled BP was numerically higher among those receiving triple therapy, but no statistically significant association between treatment intensity and BP-control status was demonstrated.

5. STRENGTHS AND LIMITATIONS

Strengths

1. The study included 384 adults with established hypertension.
2. It evaluates real-world antihypertensive prescribing in a tertiary-care hospital.
3. Treatment was examined separately as monotherapy, dual therapy and triple therapy.

4. Individual drug classes and commonly used combinations were described.
5. BP-control status was evaluated in relation to treatment intensity.
6. Indian and South Indian literature provides an appropriate context for interpreting the findings.

Limitations

1. The cross-sectional design does not permit causal inference.
2. The study was performed at a single tertiary-care centre, which may limit external generalizability.
3. Treatment selection may have been influenced by baseline BP, duration of hypertension and comorbid conditions.
4. Medication adherence was not incorporated into the present analysis.
5. Long-term cardiovascular and renal outcomes were not assessed.
6. Potential confounding factors were not adjusted for in the present analysis.

6. CONCLUSION

In this tertiary-care cohort of adults receiving established treatment for hypertension, combination antihypertensive therapy was frequently used, with almost three-fifths of patients receiving two or more antihypertensive agents.

Calcium channel blockers constituted an important component of both monotherapy and combination regimens, with CCB + ARB being the most frequently observed dual regimen.

Overall, 63.0% of patients achieved BP control according to the JNC 8 criteria applied in the study. The proportion with controlled BP was numerically greater among patients receiving dual and triple therapy than among those receiving monotherapy.

Nevertheless, the difference in BP-control status across treatment-intensity groups did not reach statistical significance. These findings describe real-world prescribing and BP-control patterns in a tertiary-care setting and should not be interpreted as evidence of superiority of any particular treatment intensity.

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