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Research Article

Comparative Effectiveness Of Combination Versus Single-Agent Antihypertensive Therapy In A Tertiary-Care Cohort: A Prospective Observational Study

Dr. Sayali Kavitate*, Dr. Dhanashree Chavan, Dr. Mrunali Gholap, DR. Priyanka Jawalkar

Abhinav Education Society's College of Pharmacy (B. Pharm), Pune, Maharashtra, India, Sahyadri Super Specialty Hospital, Deccan, Pune, Maharashtra, India

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ABSTRACT

Uncontrolled hypertension remains a major driver of cardiovascular disease burden in India, and clinicians increasingly turn to multi-drug regimens once a single agent fails to bring pressure under control. This study compared how combination antihypertensive therapy performed against monotherapy in a real-world hospital population, with a closer look at patients who also had diabetes or hypothyroidism. We prospectively followed 250 adults admitted with hypertension to a tertiary-care hospital in Pune over six months, recording the antihypertensive agents used, associated comorbidities, and blood pressure readings taken at admission and at follow-up. Men made up 66% of the cohort, and just over half the patients were between 51 and 70 years old. Physicians chose combination regimens for 170 patients (68%) and monotherapy for the remaining 80 (32%). Among those on a single drug, angiotensin receptor blockers were favoured (37.5%), closely trailed by calcium channel blockers (35%), with telmisartan and amlodipine the most frequently selected individual agents. When two drugs were combined, telmisartan plus amlodipine was by far the commonest pairing and brought 81% of recipients to their blood pressure goal. Patients on combination therapy showed consistently larger reductions in both systolic and diastolic pressure than those on monotherapy. In the diabetes subgroup, 93.5% reached target BP, with an average systolic fall of 17 mmHg, while patients with hypothyroidism responded best to regimens built around calcium channel blockers and beta-blockers. Taken together, these findings indicate that rational combination therapy, particularly telmisartan with amlodipine, controlled blood pressure more effectively than monotherapy in this cohort

***Corresponding Author:** Dr. Sayali Kavitate

Address: Abhinav Education Society's College of Pharmacy (B. Pharm), Pune, Maharashtra, India, Sahyadri Super Specialty Hospital, Deccan, Pune, Maharashtra, India

Email ✉: riyakavitate@gmail.com

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and appears to be a sound early strategy in hypertensive patients who also carry diabetes or thyroid dysfunction.

INTRODUCTION

Raised blood pressure is one of the most common reasons adults seek long-term medical care, and its downstream consequences - stroke, myocardial infarction, heart failure and chronic kidney disease - place it among the largest contributors to preventable death worldwide. Global estimates put the number of affected adults above 1.2 billion, with the World Health Organization attributing roughly 7.5 million deaths a year to hypertension and its complications.¹

The condition rarely has a single cause. Elevated peripheral vascular resistance, sodium retention by the kidneys, an overactive sympathetic nervous system, and disturbances within the renin-angiotensin-aldosterone axis all interact to raise pressure, often against a backdrop of oxidative stress and endothelial injury.² Because several mechanisms are usually operating together, treating hypertension effectively often calls for drugs that act through different pathways rather than pushing a single agent to its maximum dose - a consideration that becomes more pressing in patients who also live with diabetes, chronic kidney disease or thyroid disorders, all of which are common alongside hypertension in Indian clinical practice.

Contemporary guidance, from JNC 8 through to the Indian Hypertension Guidelines and the ESC/ESH recommendations, generally supports starting with a single agent in mild disease and stepping up to two- or three-drug combinations once blood pressure remains above target or the patient's baseline cardiovascular risk is high.^{3,4} Pairing an angiotensin receptor blocker (ARB) with a calcium channel blocker (CCB) has become a particularly popular choice because the two drug classes act on separate physiological targets,

giving additive blood-pressure lowering with fewer dose-limiting side effects than would be expected from either agent alone at a higher dose.^{5,6}

Even so, published data describing how these guidelines translate into everyday prescribing at Indian tertiary hospitals, and how well the resulting regimens actually perform, remain limited - especially for patients managing hypertension alongside diabetes or hypothyroidism. This study was undertaken to document prescribing patterns and to compare blood-pressure outcomes between combination therapy and monotherapy in a hospital-based hypertensive cohort, with dedicated subgroup analyses in patients with diabetes mellitus and hypothyroidism.

Aim and Objectives

Aim: To evaluate how effectively combination antihypertensive therapy controls blood pressure and reduces cardiovascular risk in hypertensive patients, relative to monotherapy.

- To compare the incidence of cardiovascular events between patients on combination antihypertensive therapy and those on monotherapy.
- To examine how different antihypertensive combinations influence blood pressure control and cardiovascular outcomes.
- To assess the safety profile and adverse effects associated with the combination regimens used.

MATERIALS AND METHODS

Study Design and Setting

This prospective, observational, comparative study was carried out at Sahyadri Super Specialty Hospital, Pune, India, over a six-month period



after obtaining clearance from the Institutional Ethics Committee.

Participants

Two hundred and fifty hypertensive patients were enrolled. Patients were eligible if they were over 18 years of age, admitted to hospital with a confirmed diagnosis of hypertension, already receiving antihypertensive treatment, and had comorbidities such as diabetes mellitus, chronic kidney disease or cardiovascular disease. Children under 18 years, pregnant women and patients whose records were incomplete were not included.

Data Collection

A structured case-record form was used to capture demographic details, comorbid conditions, medication history (drug class, brand and dose), and relevant laboratory values. Blood pressure was measured at admission and again at follow-up or discharge, and any cardiovascular events occurring during the hospital stay were noted.

Statistical Analysis

Categorical variables such as gender distribution and drug-class usage were summarised as frequencies and percentages. Blood-pressure change from admission to follow-up was compared between the monotherapy and combination-therapy groups, and separately within the diabetes and hypothyroidism subgroups.

RESULTS

Who Was in the Study

The cohort skewed male: 164 of the 250 patients (66%) were men and 86 (34%) were women. More than half (54%) fell between 51 and 70 years of age, a further 31.2% were 71-90 years old, and only 12.8% were under 50 - a pattern consistent with hypertension becoming more common with advancing age.

Table 1: Demographic profile of the study cohort (N = 250)

Parameter	Category	n	%
Gender	Male	164	66.0
	Female	86	34.0
Age group (years)	11-30	3	1.2
	31-50	29	11.6
	51-70	135	54.0
	71-90	78	31.2
	>91	5	2.0

Monotherapy versus Combination Therapy

Combination regimens outnumbered single-agent prescriptions by roughly two to one: 170 patients

(68%) were managed on a combination and 80 (32%) on monotherapy.

What Monotherapy Looked Like (n = 80)

Table 2: Drug classes used as monotherapy

Drug class	n	%
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Angiotensin receptor blockers (ARBs)	30	37.5
Calcium channel blockers (CCBs)	28	35.0
Beta-blockers	13	16.25
Diuretics	5	6.25
ACE inhibitors	2	2.5
Vasodilators	2	2.5

Within the ARB group, telmisartan was the agent of choice, and amlodipine dominated the CCB group. Blood pressure control on ARB monotherapy was notably high, with 96.7% of

these patients reaching their systolic target and only 3.3% falling short.

Combination Regimens

Table 3: Leading antihypertensive combinations and their blood-pressure control rates

Combination	Share of overall cohort (%)	BP target reached (%)
ARB + CCB (e.g., telmisartan + amlodipine)	9.9	81
CCB + Beta-blocker	7.9	-
ARB + CCB + Diuretic	6.7	-
Beta-blocker + ARB	5.1	-
ARB/CCB/Beta-blocker + Diuretic	1.5-2.4	-

The fixed-dose pairing of telmisartan and amlodipine (sold locally as Telma-AM, Tazloc-AM and Telmkind-AM, among others) was the single most frequently dispensed brand-level regimen in the entire cohort. Plotting systolic and diastolic readings before and after treatment showed a clear downward shift in both the median and the spread of values in patients on combination therapy, a pattern that was less pronounced among those on a single drug - pointing to more consistent as well as greater blood-pressure lowering with combined regimens.

Patients With Diabetes Mellitus

Among patients who also had diabetes, CCBs and ARBs - alone or together - accounted for most prescriptions, with telmisartan plus amlodipine

again the leading combination. Blood pressure control in this subgroup was strong: 93.5% reached target, with mean falls of about 17 mmHg systolic and 7 mmHg diastolic.

Patients With Hypothyroidism

In patients with hypothyroidism, CCBs, beta-blockers and ARBs were the classes most often prescribed, whether alone or combined. Regimens pairing an ARB with a CCB, and triple combinations that added a diuretic, were particularly effective, with most patients in this subgroup reaching their blood pressure goals.

DISCUSSION

The findings from this cohort point clearly in one direction: prescribers at this hospital favoured



combination therapy over monotherapy, and that preference was borne out in the blood-pressure data. The telmisartan-amlodipine pairing, an ARB with a CCB, emerged as both the most commonly chosen and the best-performing regimen, which fits well with the broader evidence base favouring early combination treatment for optimal control.

The male predominance seen here (66%) and the rising prevalence of hypertension with age track closely with data from the National Family Health Survey-4, which similarly found higher rates among men than women up to around age 50, after which the pattern reverses.^{7,8}

That telmisartan was the preferred first-line agent in this cohort echoes what other Indian prescribing-pattern studies have reported, likely reflecting its once-daily dosing, generally favourable tolerability, and renal-protective properties relative to ACE inhibitors.³ A meta-analysis pooling data from more than 11,000 patients across 42 trials similarly found that combining two agents lowers blood pressure substantially more than intensifying a single drug, which is consistent with the advantage seen here for ARB + CCB regimens over monotherapy.⁹

Fixed-dose combinations such as telmisartan plus amlodipine also tend to improve how consistently patients take their medication, simply by reducing the number of tablets required, while offering two complementary mechanisms - calcium-channel blockade for vasodilation alongside inhibition of angiotensin II-driven vasoconstriction and aldosterone release.^{10,11} Cohort data looking at patients started on combination therapy from the outset have likewise linked this approach to a lower incidence of cardiovascular events compared with sequential dose escalation of a single drug.¹²

The strong rate of BP control seen in the diabetic subgroup (93.5%) aligns with the recognised renal benefits of ARB-based therapy, including reduced proteinuria, which make this class a sensible choice when hypertension and diabetes coexist.^{13,14}

The preference for beta-blockers and CCBs among patients with hypothyroidism observed here mirrors reports that beta-blockers help offset the bradycardia and raised vascular resistance associated with an underactive thyroid, while CCBs counter the increased arterial stiffness typical of this condition.¹⁵

These results are broadly consistent with ESH/ESC guidance, which recommends ARB + CCB as a preferred first-line combination once monotherapy proves insufficient.^{16,17} Randomised trial evidence on the telmisartan-amlodipine fixed-dose combination likewise shows superior blood-pressure lowering and comparable, if not better, tolerability against amlodipine alone.^{18,19}

CONCLUSION

In this hospital-based cohort, combination antihypertensive therapy - most often telmisartan paired with amlodipine - was prescribed more frequently and controlled blood pressure more effectively than monotherapy, including among patients living with diabetes or hypothyroidism. These observations support starting rational, guideline-consistent combination therapy early in patients who carry additional cardiovascular risk, and underline the value of tailoring antihypertensive choice to each patient's comorbidity profile rather than defaulting to a one-size-fits-all regimen.

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Conflict of Interest: The authors declare no conflict of interest.

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