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# STUDY OF PRESCRIPTION PATTERN OF ANTIHYPERTENSIVE DRUGS IN A TERTIARY CARE HOSPITAL

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## Abstract

**Background:** The present study was done to study the current trend of prescribing of antihypertensive drugs in a tertiary care hospital in India. **Materials and Methods:** A cross-sectional analysis of prescriptions of patients of essential hypertension attending the OPD of Patna Medical College, Patna, Bihar from December 2023 to March 2024. Hypertensive patients with co morbidities were excluded from study. The data were analyzed to find out demographic characteristics of patients, number of drugs prescribed per prescription, drugs, which are commonly prescribed, antihypertensive drugs used concurrently, percentage of drugs prescribed by generic name and over all drug utilization frequency. **Result:** During the whole study period, a total of 1000 prescriptions for hypertensive patients were collected, of which 500 were excluded as per the exclusion criteria. The remaining 500 had uncomplicated hypertension (62.07% were males, and 39.29% were females). A total of 962 antihypertensive drugs were prescribed in 500 prescriptions of which 69.26% were prescribed by generic names and patients, who received either mono therapy or combination therapy. **Conclusion:** This study represents the current prescribing patterns for antihypertensive drugs and provides the baseline data for similar studies in future, as patterns in prescribing antihypertensive drugs keep changing.

## INTRODUCTION

Hypertension is defined as elevated systolic blood pressure ≥140 mm Hg or diastolic blood pressure ≥90 mm Hg.[1] The prevalence of hypertension increases with age. In US, the overall prevalence of hypertension is 28.7%, but prevalence in those above 65 years is 65.4%.[2] In India 25% of urban and 10% of rural subjects are hypertensive.[3] The rise in both systolic and diastolic blood pressures is associated with an increase in cardiovascular morbidity and mortality.[4] It is reported to be the fourth contributor to premature death in developed countries and the seventh in developing countries.[5] Lowering of systolic blood pressure by 10-12 mm Hg and diastolic blood pressure by 5-6 mm Hg confers relative risk reductions of 35-40% for stroke and 12-16% for coronary heart disease within 5 years of initiating treatment.[2] Antihypertensive drug therapy has evolved in past 60 years and now a number of drugs alone and in combinations are available for the control of blood pressure.[6] The choice of an antihypertensive drug is based on efficacy, side-effects, effects on other systems and cost. Accordingly, there is a need to survey the pattern of usage of antihypertensive drugs, to see if the current usage is rational and in concordance with current guidelines for treatment of hypertension.[7] The study of prescribing patterns, is a component of medical audit which seeks monitoring, evaluation and necessary modifi cation in the prescribing practices of the prescribers to achieve rational and cost effective medical care[.8 ]Hence, the present study was done to study the current trend of prescribing of antihypertensive drugs in a tertiary care hospital in India.

## MATERIALS AND METHODS

After obtaining the approval from institutional ethical committee, this cross-sectional study was undertaken to analyze the prescriptions written for the patients with essential hypertension who attended the OPD of Patna Medical College, Patna, Bihar from December 2023 to March 2024. Prescriptions of hypertensive patients with ischemic heart disease, congestive cardiac failure, dysrrhythmia, chronic kidney disease, hypo/hyperthyroidism, diabetes, asthma, peptic ulcer or other co-morbidities were excluded from the study. The demographic characteristics of patients, number of drugs prescribed per prescription, drugs which are commonly and most prescribed,


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antihypertensive drugs used concurrently, percentage of drugs prescribed by generic name and over all drug utilization frequency were the parameters analyzed from the data collected from these prescriptions.

## RESULTS

During the whole study period, a total of 1000 prescriptions for hypertensive patients were collected, of which 500 were excluded as per the exclusion criteria. The remaining 500 had uncomplicated hypertension (62.07% were males, and 39.29% were females). A total of 962 antihypertensive drugs were prescribed in 500 prescriptions of which 69.26% were prescribed by generic names and patients, who received either mono therapy or combination therapy i.e., two or more drug regimens, is shown in [Table 1]. Overall, 32.18% patients were treated with a single anti-hypertensive drug, and 69.76% were treated with antihypertensive drug combinations. Among the combination treatment regimens, 2-drug regimen was most commonly used (62.44%), while utilization of 3-, 4-, 5- and 6-drug regimen accounted for 29.59%, 5.84%, 0.59% and 0.23%, respectively. We observed that thirteen different 2-drug antihypertensive combinations were prescribed to hypertensive patients [Table 3]. 2-drug combination of a calcium channel blocker (CCB) with a diuretic was most commonly prescribed (21.44%), followed by combination of beta-blocker (BB) with a calcium-channel blocker (CCB) (17.65%). Third most common 2-drug combination was of an angiotensin-converting enzyme inhibitor (ACEI) with a BB (14.30%). Combinations of ACEI with a CCB and that with a diuretic accounted for about 18.21% each. The other 2-drug combinations individually accounted for <8% of utilization. In combination therapy, 3-drug combinations accounted for 29.55% of total prescriptions [Table 2]. In 3-drug combinations, ACEI + BB + Diuretic was the most prescribed combination (29.15%) followed by BB + CCB + Diuretic (12.89%), ACEI + CCB + Diuretic and angiotensin receptor blocker (ARB) + BB + Diuretic (14.31% each), ACEI + BB + CCB (7.96%), ARB + CCB + Diuretic (5.84%) and others with individual prescription rate of less than 8%. Among the mono therapy category, four major classes of drugs which were prescribed in descending order of utilization include CCBs (33.13%), ACEIs (22.88%), diuretics (19.73%) and BBs (17.12%). In the overall utilization pattern, CCBs (58.11%) formed the most frequently prescribed class, followed by diuretics (47.65%), ACEIs (39.82%), BBs (36.32% and other.

**Table 1: Mono therapy and combination therapy of Hypertensive patients. Drug Therapy N Mono combination (%) Combination (%)**

| **Mono therapy** | **150** | **30.00** | **-** |
|---|---|---|---|
| 2-drug combination | 208 | 41.6 | 62.44 |
| 3-drug combination | 87 | 17.4 | 29.55 |
| 4-drug combination | 32 | 6.4 | 5.84 |
| 5-drug combination | 8 | 1.6 | 0.59 |
| 6-drug combination | 6 | 1.2 | 0.23 |
| No drug | 9 | 1.8 | - |

**Table 2: Two drug combination therapy among males and females.**

| **Combination** | **Male** | **Female** | **Total** |
|---|---|---|---|
| CCB+Diuretic | 27 (22.14) | 24 (29.75) | 50 (25.14) |
| BB+CCB | 21 (17.26) | 15 (18.5) | 35 (17.75) |
| ACEI+BB | 22 (18.07) | 7 (8.5) | 28 (14.3) |
| ACEI+CCB | 21 (17.26) | 7 (8.5) | 27 (13.81) |
| ACEI+Diuretic | 20 (16.45) | 6 (9.75) | 27 (13.81) |
| CCB+ARB | 7 (5.88) | 8(9.75) | 14 (7.4) |
| BB+Diuretic | 6 (5.07) | 4 (4.75) | 9 (4.94) |
| Diuretic+ARB | 4 (3.44) | 6 (7.25) | 9 (4.94) |
| AB+Methyldopa | 2 (0.61) | 4 (4.75) | 5 (2.97) |
| BB+ARB | 3 (1.33) | 2 (2.25) | 4 (2.48) |
| ACEI+ARB | 0 (0) | 3 (3.5) | 3 (0.99) |
| ACEI+Carvedilol | 0 (0) | 3 (3.5) | 3 (0.99) |
| Diuretic+KD | 0 (0) | 2 (2.25) | 2 (0.39) |
| Total | 133 (100) | 93 (100) | 216 (100) |

ACEI: Angiotensin converting enzyme inhibitor,
ARB: Angiotensin receptor blocker, BB: Beta blocker,
CCB: Calcium channel blocker, KD: Potassium sparing diuretic

## DISCUSSION

Our study was a prescription-based survey, which is considered to be one of the effective means to assess and evaluate the prescribing trends and attitude of physicians and their adherence to the recommendations by the international bodies. The feedback from such prescription audits help to promote rational drug use.[9] In this study, order of utilization (percentage in parenthesis) of antihypertensive drug classes as mono therapy in decreasing order was CCBs (33.13%), followed by ACEI (22.88%), diuretics (19.73%), BBs (17.12%), ARBs (13.04%), and alpha-blockers (AB) (0.96%).


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If we consider ACEIs and ARBs as a single class i.e., drugs affecting rennin-angiotensin system (RAS), their utilization frequency (22.88+13.04%=36.82%) makes them most frequently prescribed drug class as mono therapy. Though, JNC VII and Indian hypertension guidelines II (2007) recommend Thiazide as initial therapy either alone or in combination with other classes of antihypertensive drugs, the NICE guidelines of UK recommend ACEI or a low-cost ARB for hypertensive patients aged under 55 years and a CCB to people aged over 55 years and to black people of African or Caribbean family origin of any age as the first step in treatment of hypertension unless the CCB is not suitable to the patient.[1,10,11] Most frequent use of CCBs in this study may be because of their better tolerance and well established antihypertensive efficacy. Higher utilization of ACEIs and ARBs might be because of physicians' perceptions that ACEIs and ARBs have better control of blood pressure and fewer adverse effects compared to diuretics in addition to conferring cardiovascular and renal protection. The decreasing use of diuretics or BBs, which is also reflected in our study may be explained by physician misperceptions that diuretics are less effective, less safe and BBs are less well tolerated than other medications for management of hypertension.[12,13] Although BBs is considered as one of the first line antihypertensive drug classes, they have lost their value as mono therapy in uncomplicated hypertension. Some prefer to use BBs only in patients with compelling cardiac indications for them or as add-on agents in those with uncontrolled or resistant hypertension.[14] Overall drug utilization of a drug class takes into consideration the use of said class as mono therapy as well as a part of combination therapy, of its order of preference. In this study, overall utilization (percentage in parenthesis) of individual antihypertensive drug classes in decreasing order was CCBs (58.18%) followed by diuretics (47.67%), ACEIs (39.82%), BBs (36.42%), ARBs (14.72%). However, if ACEIs and ARBs are combined together as a single group of drugs affecting RAS, this group tops the list of overall utilization frequency with 53.64% (39.82+14.72%). Diuretics ranked second most common group in overall utilization, despite being less preferred as initial choice as mono therapy, may be due to their preferred use as an add-on drug when CCBs or drugs affecting RAS failed to achieve the blood pressure control. Most hypertensive patients included in this study required two or more antihypertensive medications to achieve goal blood pressure. JNC-7 recommends initiation of therapy with combination therapy rather than a single agent if BP is more than 20/10 mm Hg above the treatment goal as in stage II hypertension.1 Combination approach for antihypertensive drugs besides offering greater control rates (due to increase in efficacy of antihypertensive drugs by synergistic effects), also minimizes adverse effects.[15] Increased plasma rennin activity induced by CCBs, ACEIs and diuretics is countered if combined with antihypertensive drugs lowering plasma rennin activity i.e., centrally acting sympatholytic drugs and BBs. Potassium loss due to diuretics can be compensated by hyperkalemic effects of drugs acting on RAS. Fluid retention responsible for the decrease in antihypertensive effects of methyldopa can be countered by combining it with diuretics. Tachycardia induced by dihydropyridine CCBs is countered by combining these with BBs. Recommendations regarding the use of combination of antihypertensive drugs are different given by different organizations. JNC-7 doesn't give clear guidelines as to which antihypertensive drug combinations should be preferred.1 Indian hypertension guidelines-II recommend to combine one out of the two groups viz. drugs acting on RAS (ACEI/ARB) or BB' with 'CCB or Thiazide diuretic but discourages the use of combination of diuretics and BBs for the fear of new-onset diabetes mellitus. It mainly emphasizes on the use of Thiazide diuretic based combinations with other first line antihypertensive drugs classes as a second step when blood pressure is not controlled by monotherapy. It further recommends use of combination of ACEI/ARB + CCB + Thiazide diuretic when 3 antihypertensive drugs are needed as a Step 3.10 European Society of Hypertension and European Society of Cardiology guidelines give a list of preferred 2-drug combinations: ACEI +Thiazide diuretic, ARB + Thiazide diuretic, ACEI + CCB, ARB + CCB, CCB+ Thiazide diuretic, CCB (dihydropyridine type only) + BB for the management of hypertension.[16] NICE clinical guidelines 127 of UK recommend combination of ACEI/ARB with CCB as a second step and combination of ACEI/ARB + CCB + Thiazide diuretic as a third step in case when the previous step has failed to achieve control of blood pressure levels.[11] In the present study, 2-drug combinations were most commonly prescribed (62.44%), followed by 3-drug combinations (29.55%) and 4-drug combinations (5.84%). This shows that use of triple drug therapy is low in proportion and is only used in cases where double drug therapy failed to achieve the goal BP. In 2-drug combinations, Diuretic + CCB was most often prescribed (21.44%), followed by a CCB + BB (17.65%). Utilization of combinations of ACEI + BB, ACEI + Diuretic and ACEIs + CCB was almost similar (12-13%). On considering ACEI and ARBs as one class i.e. drugs interfering RAS, then the utilization of antihypertensive drug combinations in decreasing order in the present study can be written as CCB + Thiazide diuretic (21.44%) followed by ACEI/ARB + CCB (18.21+4.6 = 12.91%), ACEI/ARB + Diuretic (18.81+5.94 =17.65%), BB + CCB (17.65%), ACEI/ARB + BB (13.3+1.48=18.78%) and others with frequency of <6%. In 3-drug combination, if ACEIs and ARBs are considered as one class, the first two most commonly prescribed combinations were ACEI/ARB + BB + Diuretic (36.36%), and ACEI/ARB + CCB + Diuretic (29.15%), followed by BB + CCB + Diuretic


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(12.89%), ACEI/ARB + BB + CCB (16.4%) and rest accounting less than 4% each. The combination of ACEI/ARB + BB + Diuretic is justified since diuretics produce potassium loss, while drugs interfering with RAS conserve potassium. Further, the volume depletion produced by diuretics tends to activate sympathetic nervous system leading to tachycardia, which is taken care of by addition of a BB. CCBs tend to activate RAS which leads to salt and water retention; this can be overcome by using RAS inhibitors and/or diuretics with them.

## CONCLUSION

The present study confirms that prescribing trends are rational and are as per recommended guidelines existing during that period. The study also provides the baseline data for similar studies in future, as patterns in prescribing antihypertensive drugs keep changing. After completion of this study, newer guidelines entitled "2014 evidence based guidelines for the management of high blood pressure in adults" was published in December 2013. According to these guidelines thiazide type diuretics, CCBs, ACEIs, and ARBs are considered as the first line antihypertensive drugs without any preference. As per these guidelines, BBs are not considered as the first line antihypertensive drug because in one study the use of BBs resulted in the higher rate of the cardiovascular deaths compared to use of ARBs. ABs are also not recommended for first line therapy as they worsen cerebrovascular, heart failure and combined cardiovascular outcomes in comparison to diuretic therapy.[17] Further studies from time to time are required to study the drug utilization pattern of antihypertensive drugs. Furthermore, physicians should be sensitized to adhere to the standard treatment guidelines.

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