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Original Research Article

A prospective observational study of prescription pattern of antihypertensive drugs in general medicine outpatient department of associated hospital RUHS CMS, Jaipur

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ABSTRACT

Background: The increasing prevalence of hypertension is attributed to population growth, ageing and behavioural risk factors, such as unhealthy diet, harmful use of alcohol, lack of physical activity, excess weight and exposure to persistent stress. The aim of study is the prescribing pattern and the consumption of antihypertensive drugs in isolated hypertensive patients and in hypertensive patients with different co-existing morbidities.
Methods: The present study is a Prospective observational study. The study was conducted at Medicine Department of associated hospital of RUHS College of Medical Sciences, Jaipur.
Results: A total of 965 patients having hypertension were analyzed, in that 556 patients were male and 409 patients were female. In hypertension patients, angiotensin receptor blockers ARB, diuretics and β- blockers (29.90%) were mostly used classes in three drug therapy. Whereas telmisartan, hydrochlorothiazide and metoprolol (35.05%) were mostly prescribed. Drugs. In hypertension patients, angiotensin receptor blockers ARB, diuretics, β- blockers and calcium channel blockers (56.67%) and calcium channel blockers, angiotensin converting enzyme inhibitors, β-blockers and diuretics (43.33%) were used classes in four drug therapy. Whereas Telmisartan, Hydrochlorothiazide, Nebivolol and Amlodipine (62.5%) were mostly prescribed drugs. Hypertensive Patients with Comorbidity were found in higher prevalence with 276 hypertensive patients (28.60%) along with Diabetes Mellitus most commonly found and 389 hypertensive patients (40.31%) were found to be with No Comorbidity.
Conclusions: Present results reveal that antihypertensive medication adherence to JNC-8 recommendations is suboptimal. Therefore, physicians should follow JNC-8 guidelines to improve the patients care because suboptimal adherence leads to adverse clinical outcomes. The present study demonstrated that physicians are not completely adhering to standard guidelines while treating hypertension with co-morbid conditions.

Keywords: Antihypertensive drug prescription patterns, JNC-8

INTRODUCTION

The history of hypertension research dates back to the 18th century, starting with the development of suitable methods to measure blood pressure. The first external, non-invasive device used to measure blood pressure was invented by Vierordt in 1855, and the first sphygmomanometer was invented by von Basch in 1881. The introduction of von Basch's sphygmomanometer into clinical medicine was accepted by some physicians as a valuable aid to diagnosis, but others were skeptical.[1] In 1896, Riva-Rocci reported the method that led to a prototype of the modern mercury

sphygmomanometer, which was later replaced by electronic and aneroid devices due to health concerns related to mercury.[2] In 1905, Nikolai Korotkoff reported that tapping sounds could be heard as the cuff was deflated by placing a stethoscope over the brachial artery at the cubital fossa, which became widespread in the first half of the 20th century.[3]

Improvements in blood pressure measurement techniques facilitated the discovery of the association between mortality and hypertension in the early 20th century. The Actuarial Society of the United States first reported on blood pressure in 1925, and subsequent reports showed a positive relationship between age and blood pressure elevations as well as mortality. In 2002, a meta-analysis of 61 prospective studies on more than one million adults reported that mortality increased progressively throughout the blood pressure range, and there was no evidence of an abnormal blood pressure threshold. Despite evidence for the relationships between increased blood pressure and mortality and cardiovascular disease events, there have been doubters in the medical profession and in the lay press about the imperative need to reduce blood pressure.

Hypertension is a medical condition that involves persistently elevated arterial blood pressure and is a strong independent risk factor for coronary and cerebrovascular diseases, heart failure, atrial fibrillation, and chronic renal failure. Essential hypertension, which constitutes about 90-95% of all cases, has no specific identifiable cause, but genetics, age, environment, weight, and race are implicated in its pathogenesis. Secondary hypertension, accounting for about 10% of cases, is a symptom of an identified medical problem such as renal disease or drug-induced factors. Recent data from the World Health Organization (WHO) indicates that nearly one billion people worldwide suffer from hypertension, and with the aging of the population, this number could reach 1.5 billion by 2025. About 62% of strokes and 49% of heart attacks are caused by high blood pressure. Hypertension often runs in families, indicating that genetic factors may play an important role in its development. The Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure suggests that systolic blood pressure greater than 140 mmHg is a more important cardiovascular disease risk factor than diastolic blood pressure in persons over 50 years. Reducing blood pressure in hypertensive patients is associated with a significant reduction in the rate of cardiovascular complications and decline in renal function.[4]

Understanding the regulation of arterial blood pressure is important for managing hypertension and antihypertensive drug therapy. Multiple factors can contribute to hypertension, including malfunctions in humoral or vasodepressor mechanisms, abnormal neuronal mechanisms, defects in autoregulation, and disturbances in sodium, calcium, and natriuretic hormone. These factors are often affected by the renin-angiotensin-aldosterone system, which ultimately regulates blood pressure. Hypertension can result from increased cardiac output and/or increased total peripheral resistance.[5]

Table 1: Causes of uncontrolled hypertension.

Causes
Improper blood pressure measurement
Heavily calcified or arteriosclerotic arteries that are difficult to compress (in elderly persons)
White-coat effect
Poor patient adherence
Side effects of medication
Complicated dosing schedules
Poor relations between doctor and patient
Inadequate patient education
Memory or psychiatric problems
Costs of medication
Related to antihypertensive medication
Inadequate doses
Inappropriate combinations
Physician inertia (failure to change or increase dose regimens when not at goal)

Essential hypertension, or high blood pressure without a specific identifiable cause, is affected by several humoral mechanisms. These mechanisms include the renin-angiotensin-aldosterone system (RAAS), natriuretic hormone, hyperinsulinemia, neuronal regulation, peripheral autoregulatory components, and vascular endothelial mechanisms. The RAAS plays an important role in regulating arterial blood pressure through its effect on sodium, potassium, and fluid balance. Renin catalyses the conversion of angiotensinogen to angiotensin I in the blood, and angiotensin II exerts biologic effects in several tissues, including direct vasoconstriction and stimulation of catecholamine release from the adrenal medulla, among other pressor and volume effects. Natriuretic hormone inhibits sodium and potassium ATPase and interferes with sodium transport across cell membranes. Increased insulin concentrations may lead to hypertension through increased renal sodium retention and enhanced sympathetic nervous system activity, and insulin also has growth hormone-like actions that can induce hypertrophy of vascular smooth muscle cells. The central and autonomic nervous systems are involved in regulating arterial blood pressure, and abnormalities in renal or tissue autoregulatory systems can cause hypertension.[6] The vascular endothelium and smooth muscle also play important roles in regulating blood vessel tone and blood pressure. The aforementioned mechanisms help explain the pathophysiology of essential hypertension and offer potential targets for treatment.[7]

Various factors contribute to uncontrolled hypertension, including non-compliance to prescribed therapy, inappropriate measurement method, white-coat effect, lifestyle, drug-related causes, and secondary hypertension. The Anglo-Scandinavian Cardiac Outcome Trial (ASCOT) identified baseline SBP and choice of

subsequent antihypertensive drug as the two most important causes of uncontrolled hypertension and resistance (Table 1).[8] Age, gender, and ethnicity are also factors influencing BP control. Many studies show that older patients have lower levels of hypertension control, and improvement in hypertension control rate over time was found to be lower in aged hypertensive patients. Sex differences in hypertension control, awareness, and treatment rates have been reported. Several studies reported that hypertension control levels are lower in African-Americans than in Caucasians.[9] The association between poor BP control and high BMI has been confirmed by several studies. Associations between CVD, diabetes mellitus (DM) and CKD and uncontrolled BP have been found in several studies.[10] Multi-antihypertensive drugs can be independent predictors of poor BP control. The quality of care provided to hypertensive individuals with comorbidity influenced BP control, and that the care of these patients was better than that given to patients without comorbidities.[11]

The study aims to investigate the prescription pattern of antihypertensive drugs in a general medicine outpatient department. The primary objectives are to assess the prescribing pattern and consumption of antihypertensive drugs in hypertensive patients with and without comorbidities. The secondary objectives are to observe non-pharmacological management of hypertension and investigate adherence to JNC-8 guidelines[12] for hypertension treatment in adults.

METHODS

A prospective observational study was conducted at the medicine department of RDBP Jaipuria Hospital in Jaipur, aimed at analyzing the prescription pattern of antihypertensive drugs in patients with or without comorbidities. The study period was from Sept 2022 to Feb. 2023 i.e., six months after obtaining ethical approval [01/09/2022] from the Institutional Ethics Committee of the RUHS college of medical sciences. The study aims to investigate the adherence to the joint national commission-8 (JNC-8) guidelines on the treatment of hypertension in adults. Before starting the study, doctors and nursing staff were sensitized regarding the study.

The study included patients of either sex with primary and secondary hypertension in the medicine outpatient department, aged 18 years or above, with written informed consent. Pregnant women and patients below the age of 18 years were excluded. The sample size was 1000 prescriptions based on the patient load of hypertensive patients in the hospital. The prescriptions were analyzed for blood pressure control, number of drugs prescribed per prescription, commonly and mostly prescribed drugs, and antihypertensive drugs used concurrently. The study also observed the non-pharmacological management of hypertension. Data was validated and analyzed using SPSS, and results were expressed in terms of percentage.

RESULTS

The analysis and interpretation of data collected in a study are crucial for answering research questions and testing hypotheses.

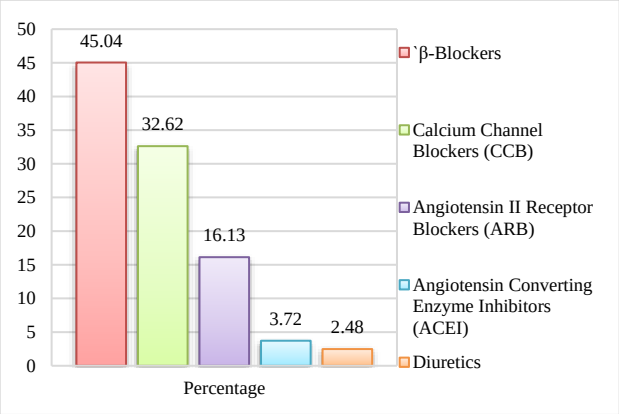

Figure 1: Classes of antihypertensive drugs used to treat hypertensive patients.

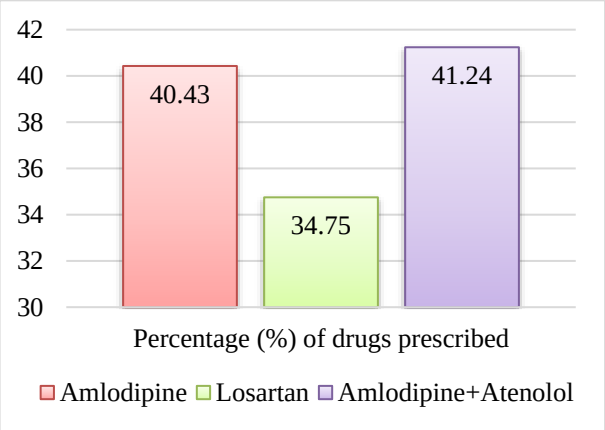

Figure 2: Prescribing pattern of antihypertensive drugs for hypertensive patients with most common drugs prescribed.

Table 2: Type of therapy preferred in hypertensive patients.

Type of Therapy	N	%
Monotherapy	564	58.45
Two drug therapy	274	28.39
Three drug therapy	97	10.05
Four drug therapy	30	3.11

The purpose of data analysis is to describe the data in meaningful terms, and it includes the compilation, editing, coding, classification, and presentation of data. The data are carefully evaluated for quality, and statistical methods are used to draw inferences from them. Adherence to treatment guidelines is essential to achieve optimum blood pressure control. The present study was conducted on 965

subjects aged between 18 to +65 years with Prescription Pattern of Antihypertensive drugs.

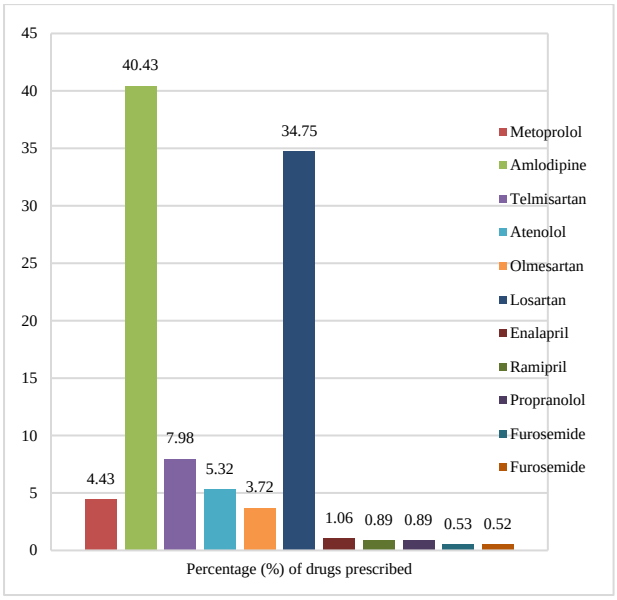

Figure 3: Prescribing pattern of monotherapy.

The study analyzed 965 patients with hypertension, of whom 57.9% were male and 42.1% were female. The highest prevalence of hypertension was found in the age group of 55-64 years. Overweight patients (40.10%) had a higher prevalence of hypertension than other categories. Patients living in urban areas had a higher prevalence of hypertension (51.50%) than those living in rural areas. Manual workers (53.89%) were more likely to be hypertensive, and patients living in noisy areas had a higher prevalence of hypertension (73.99%). The study results showed that Beta-Blockers were the most commonly prescribed antihypertensive drugs (45.04%), followed by calcium channel blockers (32.62%) and diuretics (2.48%) (Figure 1,2).

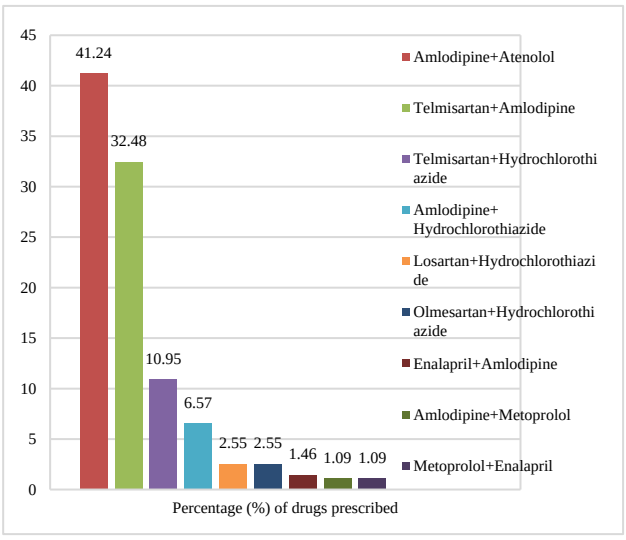

Figure 4: Prescribing pattern of two-drug therapy.

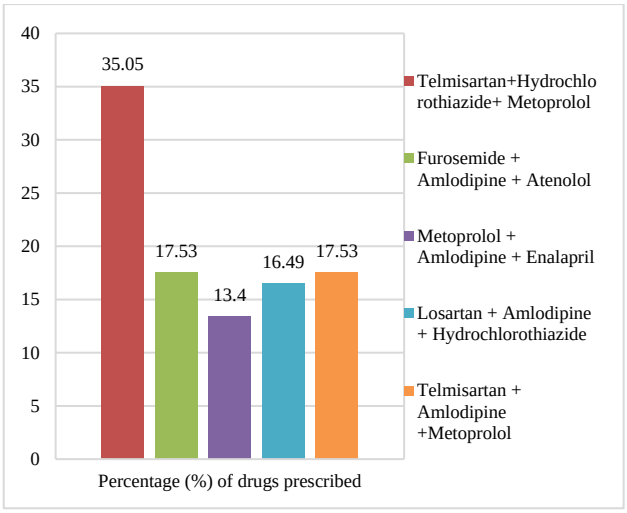

Figure 4: Prescribing pattern of two-drug therapy.

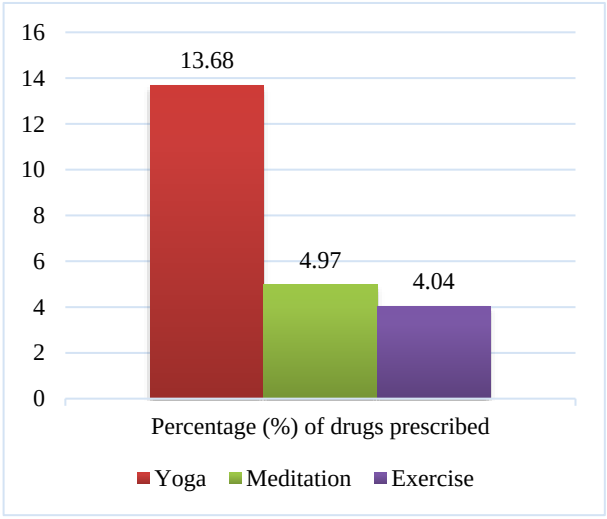

Figure 6: Prescribing pattern of antihypertensive drugs for hypertensive patients with non-pharmacological treatment.

Table 3: Prescribing pattern of antihypertensive drugs for hypertensive patients four drug therapy (n=30).

Drugs prescribed	N	%
Telmisartan+Hydrochlorothiazide+ Nebivolol+Amlodipine	30	100

The prescribing pattern differed significantly between isolated hypertensive patients and hypertensive patients with co-existing morbidities. The prescribing pattern was more rational in isolated hypertensive patients than in hypertensive patients with co-existing morbidities. In the latter group, irrational polypharmacy was observed. The study results also showed that non-pharmacological management of hypertension was not adequately emphasized. Only 1.3% of patients received dietary advice, and only 0.5% received advice on physical activity (Figure 6).

DISCUSSION

The current study is an attempt forward in a series of previous studies done internationally to study the prescription pattern of antihypertensive drugs in general medicine out patient department. The data obtained from this study are discussed here, and the results have been compared with other similar studies. A total of 965 patients having hypertension were analyzed, in that 556 patients (57.90%) were male and 409 patients (42.10%) were female. This result was similar to the study conducted by Chobanian et al also reported that male patients were more prone to hypertension.[13] The total numbers of antihypertensive prescribed drugs for the study population were found to be (40.43%) and the most commonly prescribed drugs are Amlodipine. A similar study was done by Rachana et al reported that Amlodipine (37.3%) were most frequently used class of antihypertensive drugs.[14] In hypertension patients, β-blockers (45.04%) are mostly used classes in monotherapy whereas Amlodipine (40.43%) is mostly prescribed. This result was similar to the study conducted by Tiwari et al.[15] Similar studies conducted by Pai et al reported monotherapy in 49% of hypertensive patients while Etuk et al reported monotherapy only in 20% cases of hypertension.[16,17]

The dual therapy was more widely used. A similar study was done by Mankadavath et al reported that 47.5% in their study group were on dual therapy, which correlated with our results.[18] In hypertension patients, β-blockers with calcium channel blockers (CCB) (38.32%) are mostly used classes in two drug therapy. Where in amlodipine with atenolol (41.24%) were mostly prescribed. A similar study done by Rachana et al 2014 reported calcium channel blocker (41.97%) were most frequently used class of antihypertensive drugs.[15]

In hypertension patients, angiotensin receptor blockers ARB, diuretics and β- blockers (29.90%) were mostly used classes in three drug therapy. Whereas telmisartan, hydrochlorothiazide and metoprolol (35.05%) were mostly prescribed. This result was similar to the study conducted by Tiwari et al.[15]

In hypertension patients, angiotensin receptor blockers ARB, diuretics, β- blockers and calcium channel blockers (CCB) (56.67%) and calcium channel blockers (CCB), angiotensin converting enzyme inhibitors (ACEI), β-blockers and diuretics (43.33%) were used classes in four drug therapy. Whereas Telmisartan, Hydrochlorothiazide, Nebivolol and Amlodipine (62.5%). This result was similar to the study conducted by Tiwari et al.[15] In addition, the comorbidity of the hypertensive patients was analysed. The study reveals that majority of the study population were suffering from diabetes mellitus. A similar study conducted by Rajasekhar et al also reported that most common comorbid condition among hypertensive population was diabetes mellitus.[19] This report correlates with our study result. It is evident that Prescribing Pattern of Antihypertensive Drugs for Hypertensive Patients with Comorbidity were found in higher prevalence with 276 hypertensive patients (28.60%) along with Diabetes Mellitus Comorbidity most commonly found and 389 hypertensive patients (40.31%) were found to be with No Comorbidity. This result was similar to the study conducted by Tiwari et al.[15]

Adherence of JNC 8 guidelines among all study hypertensive participants while prescribing medications varied between 62% to 92%, with an average of 75%. The least adherence (61%) was to recommendation 4 and 10 to initiate pharmacologic treatment in the population aged ≥ 18 years with chronic kidney disease to lower BP to goal of less than 140/90 followed by 62% adherence if goal BP cannot be reached with 2 drugs, add and titrate a third drug from the list provided. None of the patients was prescribed ACEI and an ARB together. However, 73% of the prescriptions were adherent to recommendation 5 to initiate pharmacologic treatment in the diabetes population. The overall rate of adherence was 06/22 (27.27%) in prehypertension; 92% in stage 1 hypertension; and 78% in stage 2 hypertension patients. Almost 100% adherence rate among the patients of hypertensive emergency and urgency with the JNC 8 guidelines was noticed.

Limitations

The limitations include various aspects. Data were collected from only one institution; therefore, population is relatively homogenous. Due to small sample size, variability and vagueness should be noted as limitations. A larger sample size would produce more detailed, robust, and explanatory assessments. Large studies involving heterogeneous population are required. Secondly, the study was conducted during only the summer months and over a short duration. Extending the study period and expanding the study to include fall or winter months may provide input for comparison to determine if seasons impact BP control. Despite these limitations, the strength of the data collected is such that it revealed several important aspects of the antihypertensive drug utilization pattern and adherence of these drugs to JNC-VIII guidelines in different co-morbid conditions.

CONCLUSION

The study concluded that there was no significant difference in prevalence of occurrence of hypertension between male and female. The prevalence of hypertension was found to be more in older than in younger patients. In the present study, overweight category peoples were more prone to hypertension, diabetes and other cardiovascular diseases. Present results reveal that antihypertensive medication adherence to JNC-8 recommendations is suboptimal. Therefore, physicians should follow JNC-8 guidelines to improve the patients care because suboptimal adherence leads to adverse clinical outcomes. In the current study, alcoholics and smokers were found to show marked attribute to hypertension and also those who intake

OTC drugs (NSAID's) increases the risk. Life style modification (proper diet, regular exercise) in patients can also help in controlling blood pressure. The future studies can focus on the periodic monitoring of drug utilization pattern in hypertensive patients. It should also focus on the control of the individual risk factor associated with patients such as smoking, alcohol, lifestyle, etc. The prevalence of adverse events due to antihypertensive drug use can be studied in different group of diseases which can help in preparing guidelines on the antihypertensive therapy management. Intervention of pharmacist in management of hypertension is very essential to prevent further complications. The guidelines for the use of antihypertensive should be reviewed and regularly updated.

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Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

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