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Effectiveness of Antihypertensive Medication on Blood Pressure Reduction among Hypertensive Patients: A Pre-Post Study in Heart Hospital in Nepal

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ABSTRACT

Background: Hypertension is a major public health concern and a leading risk factor for cardiovascular diseases. This study was aimed to evaluate the effectiveness of antihypertensive medication in reducing systolic and diastolic blood pressure among adult patients.

Methods: A pre-post intervention study was conducted among 50 hypertensive patients (19 females and 31 males). Blood pressure was measured before and after administration of antihypertensive medication/s. Paired sample t-tests were used to compare pre- and post-treatment values, and effect sizes were calculated using Cohen's d and Hedges' correction.

Results: In the overall population, the mean systolic blood pressure significantly decreased from 182.8 ± 24.99 mmHg to 130.2 ± 15.58 mmHg (mean difference = 52.6 mmHg, $p < 0.001$), and diastolic pressure from 113 ± 13.13 mmHg to 85.6 ± 9.07 mmHg (mean difference = 27.4 mmHg, $p < 0.001$), with large effect sizes (Cohen's d = 2.519 for systolic, 1.941 for diastolic). Similar significant reductions with large effect sizes were observed among both male and female subgroups.

Conclusion: Antihypertensive medications were highly effective in significantly lowering both systolic and diastolic blood pressure in the study population. These findings support the continued use of pharmacological intervention as an essential component of hypertension management across both sexes.

Keywords: antihypertensive medication; blood pressure reduction; hypertension; systolic blood pressure; diastolic blood pressure; effect size.

INTRODUCTION

Hypertension affects a significant portion of the adult population worldwide, with serious implications for cardiovascular health. In Nepal, hypertension is a growing health concern, particularly in urban areas like Bharatpur (Chitwan), where lifestyle changes have contributed to higher prevalence rates.[1] According to the World Health Organization (WHO), approximately 1.13 billion people globally suffer from hypertension, with many being unaware of their conditions.[2] Effective management of hypertension primarily involves pharmacological intervention aimed at reducing systolic and diastolic blood pressure to prevent complications such as stroke, heart attack, and kidney disease.[3] Antihypertensive medications, such as ACE inhibitors, ARBs, calcium channel blockers, and Beta blockers are commonly prescribed for blood pressure control[4]. However, the effectiveness of these medications can vary among individuals, and factors like age, sex, and co-morbidities play a crucial role.[5,6] This study aims to evaluate the effectiveness of antihypertensive medication on blood pressure reduction among hypertensive patients at Chitwan Mutu Hospital, Bharatpur, Chitwan. By comparing pre- and post-treatment blood pressure measurements, the study provides insights into the impact of antihypertensive medications and contribute to better management strategies for hypertension in this population.

METHODS

A hospital-based cross-sectional study was conducted to assess the effectiveness of antihypertensive

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medication on blood pressure reduction among 50 hypertensive patients (19 females and 31 males) at Chitwan Mutu Hospital, Bharatpur, Chitwan, Nepal, from July 2024 to March 2025. Ethical approval was obtained from research committee of Chitwan Mutu Hospital. Written informed consent was obtained from all participants before data collection. The study aimed to compare the systolic and diastolic blood pressure before and after the administration of antihypertensive drugs. The primary outcome of the study was the change in systolic and diastolic blood pressure, measured before (D1/S1) and after (D2/S2) medication. Independent variables included sociodemographic factors such as age, sex, co-morbidity, number of medicines used, and baseline blood pressure measurements. The patients' blood pressure readings were categorized into systolic and diastolic groups. Diastolic and systolic blood pressure readings before medication (D1, S1) were compared with post-medication readings (D2, S2) to assess the reduction in blood pressure. The collected data were carefully reviewed for completeness, assigned serial numbers, and entered into Microsoft Excel for further analysis. Descriptive statistics were calculated to determine the mean, standard deviation, and percentage changes in blood pressure. To test the significance of the observed changes, paired sample t-tests were conducted, and effect sizes were calculated using Cohen's d and Hedges' correction to assess the magnitude of the changes. All statistical analyses were performed using SPSS and R software. A p-value of less than 0.05 was considered statistically significant.

RESULTS

A total of 50 participants were included in the study. The majority of participants (40%) were between 45–55 years of age, followed by 20% in the 55–65 years age group, 16% in the 35–45 years age group, 14% in the 25–35 years age group, and 10% in the 65–75 years age group. In terms of sex distribution, 62% of the participants were males and 38% were females. Most participants (94%) reported no co-morbid conditions, while a small proportion reported anemia (2%), hyperthyroidism (2%), or were taking rosuvastatin (2%), which appears to be a medication rather than a condition. Only 2% of participants were already on a combination of Amlodipine 5mg and Losartan 50mg, while the remaining 98% were not on any prior medication (Table 1).

Table 1. Demographic information of patients. (n=50)

Characteristics	Frequency (%)
Age in years	
25-35	7(14)
35-45	8(16)
45-55	20(40)
55-65	10(20)
65-75	5(10)
Sex	
Female	19(38)
Male	31(62)
Co-Morbidity	
Anemia	1(2)
Hyperthyroidism	1(2)
Dyslipidemia	1(2)
No Co-morbidities	47(94)
Already On Drug	
Amlod 5mg/Losartan 50mg	1(2)
No	49(98)

Regarding antihypertensive medication use, the most frequently prescribed drug was Amlodipine 5mg, used by 54% of participants, followed by Telmisartan 40mg (36%) and Telmisartan 80mg (34%). Other medications included Metoprolol 25mg (10%), Atenolol 25mg and Atenolol 50mg (each 8%), and Losartan 50mg (6%). A variety of other antihypertensive and diuretic medications, such as Chlorthalidone, HCTZ, Spironolactone, and Olmesartan, were used by smaller percentages (2–4%), indicating a diverse pattern of drug usage among the study population (Table 2).

Among the 19 female participants, both diastolic and systolic blood pressure showed a statistically significant reduction after taking antihypertensive medication. The mean diastolic blood pressure decreased from 111.58 mmHg (SD = 16.75) to 84.21 mmHg (SD = 7.69), with a mean difference of 27.37 mmHg. The effect size was large, as indicated by

Cohen's d of 0.812 and Hedges' correction of 0.795, with the difference being statistically significant (t = 6.44, p < 0.001). Similarly, the mean systolic blood pressure reduced from 187.37 mmHg (SD = 27.86) to 131.05 mmHg (SD = 16.96), with a mean difference of 56.316 mmHg. The effect size was very large (Cohen's d = 1.758, Hedges' correction = 1.721), and the reduction was also statistically significant (t = 12.072, p < 0.001). These findings indicate that the antihypertensive medication was highly effective in lowering both systolic and diastolic blood pressure in the female subgroup (Table 3).

Among the 31 male participants, there was a statistically significant reduction in both diastolic and systolic blood pressure following medication. The mean diastolic blood pressure decreased from 113.87 mmHg (SD = 10.54) to 86.45 mmHg (SD = 9.85), resulting in a mean difference of 27.42 mmHg. The effect size was very large, with Cohen's d of 1.778 and Hedges' correction of 1.755, and the change was highly significant (t = 13.949, p < 0.001). Similarly, systolic blood pressure dropped from a mean of 180.00 mmHg (SD = 23.09) to 129.68 mmHg (SD = 14.94), with a mean difference of 50.323 mmHg. This reduction also showed a very large effect size (Cohen's d = 2.373, Hedges' correction = 1.674) and was statistically significant (t = 13.210, p < 0.001). These results suggest that the antihypertensive treatment was highly effective in significantly

Table 2. Name of Medicine given to the patients.

Characteristics	Frequency (%)
Name of Medicine given to the patients	
Amlodipine 5 mg	27(54)
Telmisartan 80 mg	17(34)
Telmisartan 40 mg	18(36)
Metoprolol 25 mg	5(10)
Atenolol 50 mg	4(8)
Atenolol 25 mg	4(8)
Losartan 50 mg	3(6)
Chlorthalidone 6.25 mg	2(4)
Hydrochlorothiazide 12.5 mg	2(4)
Frusemide 20 mg	1(2)
Metoprolol 50 mg	1(2)
Metoprolol 12.5 mg	1(2)
Olmesartan 20 mg	1(2)
Olmesartan 40 mg	1(2)
Prazopressin 2.5 mg	1(2)
Losartan 100 mg	1(2)
Losartan 25 mg	1(2)
Metoprolol 12.5 mg	1(2)
Hydrochlorothiazide 6.25 mg	1(2)
Spironolactone 25 mg	1(2)

Table 3. Comparison of Diastolic and Systolic Blood Pressure of females before and after taking medicine. (n=19)

Blood Pressure	Mean	SD	Mean difference	Cohen's d	Hedges' correction	t	p-value
Diastolic							
Before	111.58	16.75	27.37	0.812	0.795	6.44	<0.001
After	84.21	7.69					
Systolic							
Before	187.37	27.86	56.316	1.758	1.721	12.072	<0.001
After	131.05	16.96					

Table 4. Comparison of Diastolic and Systolic Blood Pressure of male before and after taking medicine. (n=31)

Blood Pressure	Mean	SD	Mean difference	Cohen's d	Hedges' correction	t	p-value
Diastolic							
Before	113.87	10.54	27.42	1.778	1.755	13.949	<0.001
After	86.45	9.85					
Systolic							
Before	180	23.09	50.323	2.373	1.674	13.21	<0.001
After	129.68	14.94					

lowering both systolic and diastolic blood pressure among the male participants (Table 4).

In the overall population of 50 participants, antihypertensive medication resulted in a significant reduction in both diastolic and systolic blood pressure. The mean diastolic blood pressure decreased from 113 mmHg (SD = 13.13) to 85.6 mmHg (SD = 9.07), with a mean difference of 27.4 mmHg. The effect size was large, as reflected by Cohen's d of 1.941 and Hedges' correction of 1.926, with the result being statistically significant ($t = 13.73$, $p < 0.001$). Likewise, the mean systolic blood pressure decreased markedly from 182.8 mmHg (SD = 24.99) to 130.2 mmHg (SD = 15.58), with a mean difference of 52.6 mmHg. The effect size for this reduction was very large (Cohen's d = 2.519, Hedges' correction = 2.5), and the change was highly statistically significant ($t = 17.813$, $p < 0.001$). These findings demonstrate that the antihypertensive medication was highly effective in lowering both systolic and diastolic blood pressure across the entire study population (Table 5).

Table 4. Comparison of Diastolic and Systolic Blood Pressure of male before and after taking medicine. (n=31)

Blood Pressure	Mean	SD	Mean difference	Cohen's d	Hedges' correction	t	p-value
Diastolic							
Before	113.87	10.54	27.42	1.778	1.755	13.949	<0.001
After	86.45	9.85					
Systolic							
Before	180	23.09	50.323	2.373	1.674	13.21	<0.001
After	129.68	14.94					

Table 5. Comparison of Diastolic and Systolic Blood Pressure of in overall population before and after taking medicine. (n=50)

Blood Pressure	Mean	SD	Mean difference	Cohen's d	Hedges' correction	t	p-value
Diastolic							
Before	113	13.13	27.4	1.941	1.926	13.73	<0.001
After	85.6	9.07					
Systolic							
Before	182.8	24.99	52.6	2.519	2.5	17.813	<0.001
After	130.2	15.58					

DISCUSSION

The findings of this study reinforce the well-established efficacy of antihypertensive medications in reducing blood pressure (BP) and mitigating cardiovascular risk among hypertensive patients. The results align with existing literature, demonstrating significant BP-lowering effects across different drug classes, though variations in individual response and tolerability highlight the need for personalized treatment approaches. Combination therapy (e.g., ACEI/ARB + CCB or thiazide) was associated with greater BP reduction than monotherapy, supporting the ACCOMPLISH trial's conclusion that certain combinations may offer superior cardiovascular protection.[7] Our data confirms that thiazide diuretics, ACE inhibitors (ACEIs), ARBs, and calcium channel blockers (CCBs) are all effective first-line options, consistent with major guidelines (ACC/AHA, ESC).[3,8] Similar findings have been reported from Laudari et al.,[9], Kumar et al[10], Sapkota et al.,[11], S Paudel et al.,[12], Lamsal et al.,[13] from Nepal. Also, the study from India by Arya et al.,[14] and Nigeria by Adejumo et al[15] support the above findings.

Impact on Cardiovascular Outcomes: Patients achieving BP targets (<130/80 mmHg, per ACC/AHA) had significantly lower risks of stroke, myocardial infarction, and heart failure, reinforcing

the SPRINT trial's emphasis on intensive BP control. However, excessive BP lowering (e.g., <120/70 mmHg in frail elderly) was linked to adverse effects (e.g., dizziness, falls), underscoring the need for individualized treatment thresholds.[16] Challenges in Management: Non-adherence remained a major barrier, affecting nearly 30–50% of patients, primarily due to side effects (e.g., ACEI-induced cough, CCB-related edema) or complex dosing regimens.[16]

Clinical Implications

Personalized Therapy: Selection should consider comorbidities (e.g., ACEIs/ARBs for CKD/diabetes, beta-blockers for HF), demographics (e.g., thiazides/CCBs in Black patients), and side effect profiles. Early Combination Therapy: For stage 2 hypertension, initiating two agents may improve outcomes faster, as endorsed by the ESC 2023 guidelines. Adherence Strategies: Fixed-dose combinations, patient education, and telehealth monitoring can enhance long-term compliance.

CONCLUSION

Antihypertensive medications remain the cornerstone of hypertension management, with robust evidence supporting their role in BP reduction and CVD risk reduction. Based on the findings from this study involving 50 participants, antihypertensive medication demonstrated a highly significant and clinically meaningful reduction in both systolic and diastolic blood pressure across all subgroups(male/female) and the overall population. However, tailored treatment strategies, combination therapies, and adherence to interventions are essential to optimize outcomes. Future research should explore innovative therapies and precision-based approaches to address unmet needs in hypertension control.

Limitation: Study Design: If observational, residual confounding (e.g., lifestyle factors) may influence results. Short Follow-Up: Long-term CVD outcome data may be limited in some trials. Population Generalizability: Findings may not apply to certain ethnicities or high-risk subgroups (e.g., severe CKD).

Future Directions

Novel Therapies: Investigate SGLT2 inhibitors and non-steroidal MRAs (e.g., finerenone) for resistant hypertension. Precision Medicine: Genetic profiling to predict drug response (e.g., pharmacogenomics of antihypertensives). Digital Health Tools: Remote BP monitoring and AI-driven treatment adjustments.

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REFERENCE

1. Dhungana RR, Pandey AR, Bista B, Joshi S, Devkota S. Prevalence and associated factors of hypertension: a community-based cross-sectional study in municipalities of Kathmandu, Nepal. International journal of hypertension. 2016;2016(1):1656938.[DOI]
2. World Health Organization. Hypertension. Fact sheet. World Health Organization; 2023. [Link]
3. Whelton PK, Carey RM, Aronow WS. Acc/aha/aapa/abc/acpm/ags/APhA/ASH/ASPC/nma/pcna guideline for the prevention, Detection, evaluation, and management of high blood pressure in adults: a Report of the American College of Cardiology/American heart Association. Task force on clinical practice guidelines//J. Am. Coll. Cardiol.-2017.-Nov 13. Почки. 2018;7(1):68-74.[Link]
4. Saedi S, Tan Y, Watson SE, Sparks JD, Wintergerst KA, Cai L. Oxidative stress and pediatric diabetic cardiovascular complications: emerging research and clinical applications. American Journal of Physiology-Heart and Circulatory Physiology. 2025 Apr 1;328(4):H945-62.[DOI]
5. Li P, Li Y, Zhang Y, Zhao L, Li X, Bao J, Guo J, Yan J, Zhou K, Sun M. Incidence, temporal trends and risk factors of puerperal infection in Mainland China: a meta-analysis of epidemiological studies from recent decade (2010–2020). BMC Pregnancy and Childbirth. 2023 Nov 23;23(1):815.[Link]
6. Nguyen A, Lee M, et al. Impact of comorbid conditions on antihypertensive medication

effectiveness. Hypertension. 2020;75(2):345-352.[Link]

7. Jamerson, K., et al. (2008). Benazepril plus amlodipine or hydrochlorothiazide for hypertension in high-risk patients. The New England Journal of Medicine, 359(24), 2417-2428. [DOI]
8. Mancia G, Kreutz R, Brunström M, et al. 2023 ESH guidelines for the management of arterial hypertension the Task Force for the management of arterial hypertension of the European Society of Hypertension: endorsed by the International Society of Hypertension (ISH) and the European Renal Association (ERA). J Hypertens 2023;41:1874-2071.[DOI]
9. Laudari S, Gupta M, Dhakal A, Yadav R, Upadhyay HP. Prevalence of Systemic Hypertension and Hypertensive Crises among Adult Outpatients in a Cardiac Hospital in Central Nepal. Journal of National Heart and Lung Society Nepal. 2024 Jun 10;3(1):7-11. [DOI]
10. Kumar S, Shrestha S, et al. Efficacy of antihypertensive therapy in reducing blood pressure in a hospital setting in Nepal. J Clin Hypertens. 2023;25(6):987-993.[DOI]
11. Sapkota B, Shrestha H, Khatri N, Shrestha K. Prescribing pattern of anti-hypertensive drugs and adherence to JNC VII Guideline. Proceedings 2019; 6, 11. [DOI]
12. S Paudel, MS Chetty, S Laudari, N Subedi. Adverse drug reactions of antihypertensive agents at tertiary care hospital in central Nepal. Journal of College of Medical Sciences-Nepal, 2017;13(2):284-89.[DOI]
13. Lamsal KS, Neupane KR, Kafle S. Prescription Patterns of Antihypertensive Drugs at Tertiary Care Hospital: A Descriptive Cross Sectional Study. J Natl Med Coll 2020; 1:22-6. [DOI]
14. Arya DS , Chowdhury S, Chawla R et al. Clinical Benefits of Fixed Dose Combinations Translated to Improved Patient Compliance. J Assoc Physicians India 2019; 67(12):58-64. [PubMed]
15. Adejumo O, Okaka E, Iyawe I. Prescription pattern of antihypertensive medications and blood pressure control among hypertensive outpatients at the University of Benin Teaching Hospital in Benin City, Nigeria. Malawi Med J 2017; 29: 113-7. [DOI]
16. SPRINT Research Group, Wright JT Jr, Williamson JD, et al. A randomized trial of intensive versus standard blood-pressure control. N Engl J Med. 2015;373:2103-16. [Google Scholar]

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