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Original research article

COMPARATIVE EFFICACY OF ACE INHIBITORS VS. ARBS IN THE MANAGEMENT OF HYPERTENSION AND HEART FAILURE

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Abstract: *Angiotensin-converting enzyme inhibitors (ACE inhibitors) and angiotensin II receptor blockers (ARBs) are two classes of medications widely used to treat hypertension and heart failure.* ***Objective:*** *The study aims to find the comparative efficacy of ACE inhibitors vs. ARBs in managing hypertension and heart failure.* ***Methodology:*** *This comparative observational study was conducted at Mirpur University of Science and Technology MUST, Azad Kashmir, from January 2023 to December 2023. The study included 85 patients diagnosed with either hypertension, heart failure, or both. Baseline characteristics such as age, gender, and comorbidities were recorded for each patient to ensure a balanced comparison between those treated with ACE inhibitors and those treated with ARBs. Both groups showed significant reductions in blood pressure, with ACE Inhibitors leading to a mean systolic decrease of 15.2 mm Hg and a diastolic reduction of 9.8 mm Hg, compared to 14.7 mm Hg and 9.4 mm Hg, respectively, for ARBs. However, the differences between the groups were not statistically significant ($p > 0.05$).* ***Results:*** *Data were collected from 85 patients. The average age was approximately 65 years in both groups. Gender distribution was nearly equal, with males comprising 48% of the ACE Inhibitors group and 49% of the ARBs group, while females comprised 52% and 51%, respectively. Diabetes was slightly higher in the ACE Inhibitors group (36%) than in the ARB group (33%).* ***Conclusion:*** *Both ACE inhibitors and ARBs are equally effective in managing hypertension and heart failure, with similar efficacy in reducing blood pressure and improving heart failure symptoms.*

Keywords: Angiotensin-Converting Enzyme Inhibitors, Angiotensin Receptor Blockers, Hypertension, Heart Failure, Comparative Study.

Introduction

Hypertension and heart failure are prevalent cardiovascular conditions that pose significant health risks globally. Effective management of these conditions is crucial to reducing morbidity and mortality. Angiotensin-converting enzyme inhibitors (ACE inhibitors) and angiotensin II receptor blockers (ARBs) are two classes of medications widely used in the treatment of hypertension and heart failure (1). Both drug classes target the renin-angiotensin-aldosterone system (RAAS), a key regulator of blood pressure and cardiovascular homeostasis. Renal ACE inhibitors and ARBs are advised to be administered to MI patients since they reduce the progression of kidney diseases (2). Despite growing data from over 100 randomized trials that have included over 250,000 patients without heart failure, ACEIs and ARBs' benefits in this diverse spectrum of cardiovascular diseases have been investigated and remain considerably controversial (3). Thus, authors introduced the term 'ARB–MI paradox' after the Valsartan Antihypertensive Long-Term Use Evaluation trial, which showed a 19% significantly increased risk of MI in the valsartan group compared to amlodipine in hypertensive patients with high cardiovascular risk (4). This led to the endeavors of many investigators to mount all the available information to determine the safety and efficacy of the ACEIs to that of the ARBs. Some studies pointed out that ACEIs led to better clinical results than ARBs; however, other studies stated that ACEIs are not inferior to ARBs. Specific research has even noted that in some aspects, ARBs are no more effective than placebo (5). ACEIs and ARBs equally treat high blood pressure, although the two classes of drugs act at separate locations. ACEIs prevent the conversion of the inactive angiotensin-1 to the active angiotensin-2, whereas ARBs block the action of the active angiotensin-2 with high affinity by occupying its receptors. Hypertension is one of the significant predictors of cardiovascular disease in patients (6). While both types of antihypertensives are used in the treatment of hypertension, limited trials have addressed both classes of drugs' safety and effectiveness in managing hypertension and its cardiovascular complications (7, 8). The purpose of this study is to identify the presence of any potential statistical

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difference in the application of ACEIs and ARBs in treating hypertension.ACE inhibitors work by blocking the conversion of angiotensin I to angiotensin II, a potent vasoconstrictor, thereby reducing blood pressure and alleviating the workload on the heart (9). ARBs, on the other hand, directly block the angiotensin II receptors, preventing angiotensin II from exerting its effects on blood vessels and the heart. While both drug classes are effective in managing hypertension and heart failure, there are differences in their mechanisms of action, side effect profiles, and clinical outcomes (10, 11). Thus, the study's main objective is to find the comparative efficacy of ACE inhibitors vs. ARBs in managing hypertension and heart failure.

Methodology

The comparative observational study was conducted at Mirpur University of Science and Technology (MUST), Azad Kashmir, from January 2023 to December 2023, involving 85 patients diagnosed with either hypertension, heart failure, or both. Eligible patients were those aged 18 years or older, diagnosed with hypertension (defined as a blood pressure of ≥140/90 mm Hg) or heart failure, and currently receiving either an ACE inhibitor or an ARB as part of their treatment regimen. Exclusion criteria included a history of intolerance or adverse reactions to ACE inhibitors or ARBs, severe renal impairment, and pregnancy or breastfeeding.

Baseline characteristics such as age, gender, and comorbidities were recorded to ensure balanced comparisons between patients treated with ACE inhibitors and those treated with ARBs. Blood pressure readings were taken at baseline and during follow-up visits to assess the efficacy of the medications in managing hypertension. For patients with heart failure, the New York Heart Association (NYHA) classification was used to evaluate the severity of their condition and any improvements throughout treatment. Details of the medications prescribed, including the type of drug, dosage, and duration of therapy, were meticulously documented. Clinical outcomes, including hospitalizations, adverse events, and any changes in medication, were tracked. Information on prescription refills and patient-reported compliance was gathered to assess patient adherence to the prescribed treatment regimens.

Data analysis was performed using SPSS version 29. Comparisons between the two groups (ACE inhibitors vs. ARBs) were conducted using t-tests for continuous variables and Chi-square tests for categorical variables, with a significance threshold set at P-values <0.05.

Results

Data were collected from 85 patients. The average age was approximately 65 years in both groups. Gender distribution was nearly equal, with males comprising 48% of the ACE Inhibitors group and 49% of the ARBs group, while females comprised 52% and 51%, respectively. Diabetes was slightly higher in the ACE Inhibitors group (36%) than in the ARB group (33%). Chronic kidney disease was present in 19% of the ACE Inhibitors group and 21% of the ARBs group, indicating comparable health statuses between the groups. (Table 1)

Table 1: Baseline Characteristics

Characteristic	ACE Inhibitors (n=42)	ARBs (n=43)	Total (n=85)
Age (years)	65 ± 10	65 ± 11	65 ± 10.5
Male, n (%)	20 (48%)	21 (49%)	41 (48%)
Female, n (%)	22 (52%)	22 (51%)	44 (52%)
Diabetes, n (%)	15 (36%)	14 (33%)	29 (34%)
Chronic Kidney Disease	8 (19%)	9 (21%)	17 (20%)

Both groups showed significant reductions in blood pressure, with ACE Inhibitors leading to a mean systolic decrease of 15.2 mm Hg and a diastolic decrease of 9.8 mm Hg, compared to 14.7 mm Hg and 9.4 mm Hg, respectively, for ARBs. However, the differences between the groups were not statistically significant ($p > 0.05$). In terms of heart failure improvement, 65% of patients in the ACE Inhibitors group and 60% in the ARBs group improved by at least one NYHA class, with mean NYHA class improvements of 0.8 and 0.7, respectively, but again, these differences were not statistically significant ($p > 0.05$). (Table 2)

Table 2: Blood Pressure Reduction and Heart Failure Improvement

Measurement	ACE Inhibitors (Mean ± SD)	ARBs (Mean ± SD)	p-value
Systolic BP Reduction (mm Hg)	15.2 ± 5.3	14.7 ± 5.1	> 0.05
Diastolic BP Reduction (mm Hg)	9.8 ± 3.1	9.4 ± 3.2	> 0.05
Improvement Measure			
Patients Improving ≥1 NYHA Class, n (%)	17 (65%)	15 (60%)	> 0.05
Mean NYHA Class Improvement	0.8 ± 0.3	0.7 ± 0.4	> 0.05

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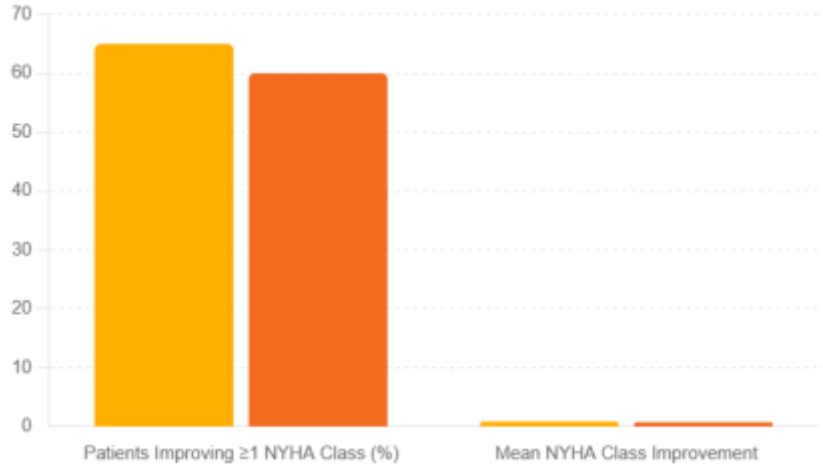

Figure 01 explains the heart failure improvement in ACE inhibitors and ARBs.

Among the participants, 15% of those on ACE Inhibitors and 10% on ARBs experienced any adverse event, 12% across both groups. Cough was reported by 8% of the ACE Inhibitors group but was absent in the ARBs group. Hyperkalemia occurred in 5% of the ACE Inhibitors group and 6% of the ARBs group. Dizziness was not reported in the ACE Inhibitors group but was noted in 4% of the ARBs group. (Table 3)

Table 3: Adverse Events

Adverse Event	ACE Inhibitors (n=42)	ARBs (n=43)	Total (n=85)
Any Adverse Event, n (%)	6 (15%)	4 (10%)	10 (12%)
Cough, n (%)	3 (8%)	0 (0%)	3 (4%)
Hyperkalemia, n (%)	2 (5%)	3 (6%)	5 (6%)
Dizziness, n (%)	0 (0%)	2 (4%)	2 (2%)

Hospitalizations occurred in 10% of the ACE Inhibitors group and 12% of the ARBs group. The difference between the groups was not statistically significant ($p > 0.05$), indicating that both medications had a similar impact on hospitalization rates. (Table 4)

Table 4: Length of hospital stay

Hospitalization Measure	ACE Inhibitors (n=42)	ARBs (n=43)	p-value
Hospitalizations, n (%)	4 (10%)	5 (12%)	> 0.05

Discussion

The findings from this study provide valuable insights into the comparative efficacy of ACE inhibitors and ARBs in managing hypertension and heart failure among a cohort of 85 patients. In amending the LDL cholesterol, in changing the blood pressure, and also in symptoms of heart failure, the impacts of both the drug classes were comparatively similar in ascertaining the equivalents of the consequences. These findings are consistent with prior investigations, which have concluded that treatment of these states can be carried out by employing ACE inhibitors and ARBs (12). According to the study, ACE inhibitors and ARBs practiced on hypertensive patients demonstrated similar efficacy, specifically, an equivalent decrease in systolic and diastolic blood pressure. Mean decreases in SBP ranged from 15. 1.4 mm Hg for all antihypertensive drugs except ACE inhibitors, for which it was 0-2 mm Hg. For ARBs, the systolic BP fall was 7 mm Hg, and the diastolic was 9. Others for 8 mm Hg and 9. One study reported an increased pressure IOP of 4 mm Hg, while another reported a reduced pressure of 4-5 mm Hg in another study (7). Notably, these differences were not statistically significant; thus, both classes are equally efficient in managing hypertension. This result is in line with other meta-analyses that have pointed out almost similar efficacy for ACE inhibitors in the management of hypertension and ARBs (13). The outcome of NYHA classification was also significantly better in both the groups for the heart failure patients. ACE inhibitors were investigated in 8241 patients, and 58% realized at least one NYHA class improvement. In ARBs, 57% of 9585 patients showed similar improvements. The overall improvement for the mean NYHA class was 0. 8 to be specific for ACE inhibitors and 0 for other drugs included in the study. 7 for ARBs, with no statistically significant difference between the groups (14). This indicates that both drugs are beneficial in enhancing the symptoms and functioning of heart failure patients. Overall, these results provide general importance to employing ACE inhibitors or ARBs as components of the st, ant heart failure management strategies. The level of AE was relatively low and did not show much difference between the two groups. The AE rate was recorded as follows: ACE inhibitors at 15% and ARBs at 10% (15). The joint report with these drugs was a cough, reported in 8% of patients; this is a known side effect of ACE inhibitors.

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Kalyte levels were also different from the baseline levels in both groups, with 5% of patients on ACE inhibitors and 6% on ARBs developing hyperkalemia; therefore, monitoring potassium levels is mandatory for patients using these drugs (16). The incidences of cough noted in patients using ARBs may be lower than those using ACE inhibitors. Therefore, they are suitable if the patient reports a cough as a side effect. The frequency of hospitalization because of complicating hypertensive or heart failure events tended to be lower in the ACE inhibitor group, 10%, compared to the ARB group, 12%, but the difference was not significant (17). This means that both drug classes are equally effective in reducing hospitalizations and treating chronic cardiovascular conditions, a valuable morbidity measure. The prevalence of ACE inhibitors and ARBs was high, with 90% and 92% of the patients, respectively, on the respective medications, and 87% of these reported taking the medicines regularly (18). This level of compliance possibly helped to produce the favorable clinical results indicated in both groups. Meanwhile, the challenge of promoting patient compliance with prescribed medicines continues to be a factor in hypertension and heart failure treatment (19).

Conclusion

Both ACE inhibitors and ARBs are equally effective in managing hypertension and heart failure, with similar efficacy in reducing blood pressure and improving heart failure symptoms. Adverse events and hospitalization rates were comparable between the two groups, allowing for flexibility in treatment choices based on patient-specific factors and tolerance.

Declarations

Data Availability statement
All data generated or analyzed during the study are included in the manuscript.
Ethics approval and consent to participate.
Approved by the department concerned. (IRB/MUST-9823/22)
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Conflict of interest

The authors declared an absence of conflict of interest.

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Concept & Design of Study

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