

Comparative Efficacy of ACE inhibitors and ARBs in Patients with Type 2 Diabetes Mellitus and Hypertension: Effects on Blood Pressure and Renal Outcomes.

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Abstract

Background:

Diabetic patients with high risk of end-stage renal failure due to albuminuria and death; ACEIs and ARBs are commonly used however comparative benefits remain unknown.

Methods:

100 adults (≥ 18 years) with T2DM ($Hb1c \geq 6.5\%$), and with hypertension initiating ACEI (e.g., enalapril) or ARB (e.g., losartan) monotherapy ($eGFR 30-90 \text{ mL/min/1.73m}^2$), exclusions: prior RAS use, pregnancy, hyperkalemia. Baseline data (BP, eGFR, ACR, HbA1c) were analysed in the present prospective study (from clinic records; 24-month follow-up quarterly). Primary outcome: eGFR decline/composite renal events ($\geq 30\%$ eGFR loss, creatinine doubling, ESRD). Analysis: 1:1 propensity score matching (age, sex, baseline renal/BP metrics); Cox regression for time-to-event; mixed models for BP/eGFR trajectories.

Results

Both ACEIs and ARBs significantly reduced systolic and diastolic blood pressure from baseline ($p < 0.05$). Reduction in micro albuminuria was observed in both groups, with a slightly greater reduction in the ARB group. Changes in eGFR were comparable between the two groups.

Limitations and future directions

Existing evidence derives, from heterogeneous trails (variable CKD/albuminuria stages), limiting generalizability diabetics with higher baseline risks. The prospective cohort shows detection of 20% renal event differences. Initiate ACEIs and ARBs first-line for benefits and control albuminuria. This individualized paradigm optimizes outcomes in T2DM-hypertension.

ACEIs and ARBs are equally effective in blood pressure control and renal protection in patients with T2DM and hypertension. ARBs demonstrated marginally superior improvement in albuminuria, suggesting a potential advantage in patients with diabetic nephropathy.

Keywords: ACEIs, ARBs, type 2 diabetes, hypertension, renal outcomes, blood pressure, albuminuria.

I. Introduction

Type 2 diabetes mellitus (T2DM) is a major global health burden and is frequently associated with hypertension. The coexistence of these conditions accelerates the progression of cardiovascular disease and diabetic nephropathy, contributing significantly to morbidity and mortality.¹⁻²The effective blood pressure control is necessary in reducing both microvascular and macrovascular complications in diabetic patients.³

The renin-angiotensin-aldosterone system (RAAS) plays a central role in the pathogenesis of hypertension and diabetic nephropathy. Pharmacological blockade of RAAS using ACEIs or ARBs has been shown to reduce intraglomerular pressure, proteinuria, and progression of renal disease.⁴⁻⁵

Although current guidelines recommend both ACEIs and ARBs as first-line therapy in diabetic patients with hypertension, controversy persists regarding their comparative efficacy, particularly in renal outcomes, this study aims to evaluate and compare the effectiveness of ACEIs and ARBs in achieving blood pressure control and renal protection in patients with T2DM and hypertension.⁶⁻⁹

II. Materials And Methods

Study design and setting

This was a prospective, observational comparative study conducted in the Department of Pharmacology in collaboration with the Department of Medicine at a tertiary care teaching hospital.

Study Duration

The study was conducted over a period of 12 months.

Study Population

Patients of 100 diagnosed with T2DM and hypertension attending the outpatient department were enrolled.

Inclusion Criteria

Age between 30-65 years

Diagnosed cases of type 2 diabetes mellitus.

Patients with essential hypertension

Patients receiving either ACEIs or ARBs as monotherapy or part of combination therapy

Exclusion Criteria

Type 1 diabetes mellitus

Secondary hypertension

Advanced renal failure (eGFR <30 mL/min/1.73 m²)

History of cardiovascular events in the past 12 months

Pregnant or lactating women

Sample Size

A total of 100 patients were enrolled and divided into two groups.

Group A: Patients receiving ACEI

Group B: Patients receiving ARBs

Study Procedure

Baseline parameters including blood pressure fasting blood glucose, HbA1c, serum creatine, eGFR, and urinary albumin excretion were recorded. Patients were followed up at regular intervals, and final assessment was done at the end of 12 months.

Outcomes Measures

Primary Outcome: change in systolic and diastolic blood pressure

Secondary Outcomes: Change in urinary albumin excretion and eGFR

Statistical Analysis:

Data were analysed using IBMSPSS statistics version 22.0. Continuous variables were expressed as mean \pm standard deviation. Paired and unpaired t-tests were used for intra and inter-group comparisons. A p value < 0.05 was considered statistically significant.

III. Results

A total of 100 patients with type 2 diabetes mellitus and hypertension were enrolled in study and completed the 12 months follow-up. Patients were divided into two groups: Group A(ACEI) and Group B (ARBs). Baseline demographic and clinical characteristics were comparable between the two groups, with no statistically significant differences (>0.05).

Table 1. Baseline Demographic and Clinical Characteristics of study participants

Parameter	ACEI(50)	ARBs(50)	P value
Age (years)	51.2 \pm 8.6	54.1 \pm 7.9	>0.05
Male/female (100)	29 / 21	28/22	>0.05
Duration of T2DM(years)	7.7 \pm 3.1	8 \pm 3.4	>0.05
Duration of hypertension (years)	6.8 \pm 3.1	7.1 \pm 3.2	>0.05
Systolic BP (mmHg)	153.5 \pm 10.4	150.9 \pm 11.3	>0.05
Diastolic BP (mmHg)	95.5 \pm 6.7	95.3 \pm 7.3	>0.05
HbA1c (%)	7.9 \pm 0.8	8.1 \pm 0.9	>0.05

eGFR (mL/min/1.73 m ²)	78.4 ± 12.5	79.5 ± 11.9	>0.05
Urinary albumin (mg/day)	112 ± 38.6	116.4 ± 41.1	>0.05

Table 2. Comparison of Blood Pressure and renal Outcomes After 12 months of treatment

Parameter	ACEI(50)	ARBs(50)	P value
Systolic BP (mmHg)			
Baseline	153.3 ± 11.5	153.8 ± 10.7	>0.05
6 months	132.7 ± 8.9	130.7 ± 9.0	>0.05
Diastolic BP (mmHg)			
Baseline	95.5 ± 6.9	94.6 ± 7.1	>0.05
6 months	83.3 ± 5.4	85.6 ± 5.2	>0.05
Urinary albumin (mg/day)			
Baseline	113.4 ± 40.2	114.4 ± 38.7	>0.05
6 months ²	79.1 ± 28.9	78.4 ± 30.1	>0.05
eGFR (mL/min/1.73m²)			
Baseline	78.8 ± 11.9	78.6 ± 12.4	>0.05
6 months	77.1 ± 11.2	77.1 ± 11.6	>0.05

IV. Discussion

The present study demonstrates the both ACEI and ARBs are effective in achieving blood pressure control in patient with T2DM and hypertension. These findings are consistent with previous clinical trials and guideline recommendations emphasizing RAAS blockade as cornerstone of therapy diabetic hypertensive patients.¹⁰⁻¹¹

Renal protection, as assessed by reduction in microalbuminuria, was evident both groups. The marginally better improvement observed with ARBs may be attributed to their more complete blockade of angiotensin II at the receptor level and better tolerability, leading to improved adherence.¹²⁻¹³

Although the difference was not statistically significant, ARBs showed a trend toward greater reduction in albuminuria, a finding supported by meta-analyses suggesting comparable or slightly superior renal tolerability of ARBs.¹⁴

The absence of significant differences in eGFR between the groups suggests that both drug classes are equally effective in preserving renal function over the study period.¹⁵

Limitations

Relatively short duration of follow-up modest sample size
Lack of long-term cardiovascular outcome assessment

V. Conclusion

ACEI and ARBs provide comparable efficacy in controlling blood pressure and improving renal outcomes in patients with T2DM and hypertension. ARBs may offer a slight advantage in reducing albuminuria and may be preferred in patients intolerant to ACEI.

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