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RESEARCH ARTICLE

Real-world effectiveness of metformin-based regimens in type 2 diabetes: A retrospective observational study

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ABSTRACT

Background: Type 2 Diabetes Mellitus is a chronic metabolic disorder requiring long-term pharmacological management. Metformin remains the first-line therapy, either as monotherapy or in combination with other agents.

Objectives: To evaluate the real-world effectiveness of metformin-based regimens on glycemic control in patients with Type 2 Diabetes Mellitus over a 12-month period.

Methods: This retrospective observational study included 110 patients with T2DM. Patients were divided into two groups: metformin monotherapy (n=50) and metformin-based combination therapy (n=60). Clinical and biochemical parameters including HbA1c, fasting blood sugar (FBS), and postprandial blood sugar (PPBS) were analyzed. Statistical significance was determined using t-tests and chi-square tests, with $p<0.05$ considered significant.

Results: Combination therapy showed superior glycemic control compared to monotherapy. Mean HbA1c was significantly lower in the combination group (7.2 vs 7.8, p=0.02). FBS and PPBS were also significantly reduced ($p<0.05$). A higher proportion of patients achieved good glycemic control in the combination group (70% vs 50%, p=0.01). Gastrointestinal side effects were slightly higher with combination therapy but not statistically significant.

Conclusion: Metformin-based combination therapy provides better glycemic control than monotherapy in real-world settings. Early intensification of therapy may improve outcomes in patients with T2DM.

Keywords: Metformin-based combination therapy, early intensification, FBS, postprandial blood sugar (PPBS), first-line therapy

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Introduction

Type 2 Diabetes Mellitus is a progressive metabolic disorder characterized by insulin resistance and impaired insulin secretion(1). It represents a major global health burden, contributing significantly to morbidity and mortality due to its associated microvascular and macrovascular complications(2). Metformin is widely recommended as the first-line pharmacological treatment for T2DM due to its efficacy, safety profile, low cost, and cardiovascular benefits. It primarily acts by reducing hepatic glucose production and improving insulin sensitivity. However, as the disease progresses, many patients fail to achieve adequate glycemic control with metformin monotherapy alone(3).

To overcome this limitation, metformin is often combined with other oral hypoglycemic agents such as sulfonylureas, DPP-4 inhibitors, SGLT2 inhibitors, or even insulin. Combination therapy targets multiple pathophysiological defects of diabetes, leading to improved glycemic outcomes(4). Real-world evidence is essential to understand the effectiveness of metformin-based regimens outside controlled clinical trials. Factors such as patient adherence, comorbidities, and variations in treatment practices can significantly influence outcomes(5).

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This retrospective observational study aims to evaluate the effectiveness of metformin monotherapy compared to combination therapy in achieving glycemic control over a 12-month period. The study also assesses clinical outcomes and adverse effects to provide insights into optimizing diabetes management in routine clinical practice(6).

Methods

Study Design

Retrospective observational study conducted over 12 months.

Study Population

- Total patients: 110
- Metformin monotherapy: 50
- Metformin combination therapy: 60

Inclusion Criteria

- Diagnosed T2DM
- Age ≥30 years
- On metformin-based therapy

Exclusion Criteria

- Type 1 diabetes
- Gestational diabetes
- Severe comorbid illness

Data Collection

- HbA1c
- Fasting Blood Sugar (FBS)
- Postprandial Blood Sugar (PPBS)
- Adverse effects
- Hospitalization

Statistical Analysis

Data analyzed using t-test and chi-square test. $p<0.05$ considered statistically significant.

Results

Discussion

This retrospective observational study highlights the real-world effectiveness of metformin-based regimens in the management of Type 2 Diabetes Mellitus. The findings demonstrate that metformin combination therapy provides significantly better glycemic control compared to metformin monotherapy. Patients receiving combination therapy showed lower HbA1c, fasting blood glucose, and postprandial blood glucose levels(7). This can be

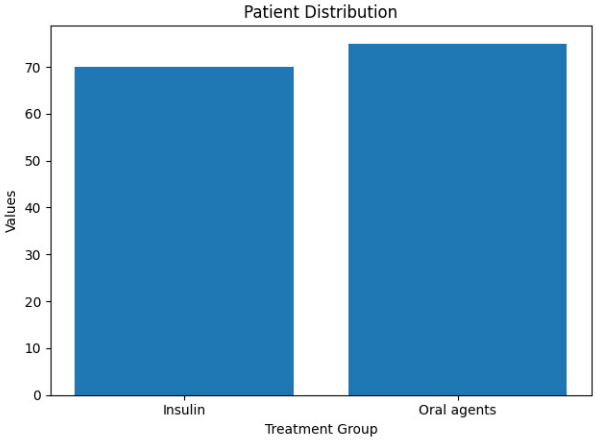

Figure 1: Patients distribution

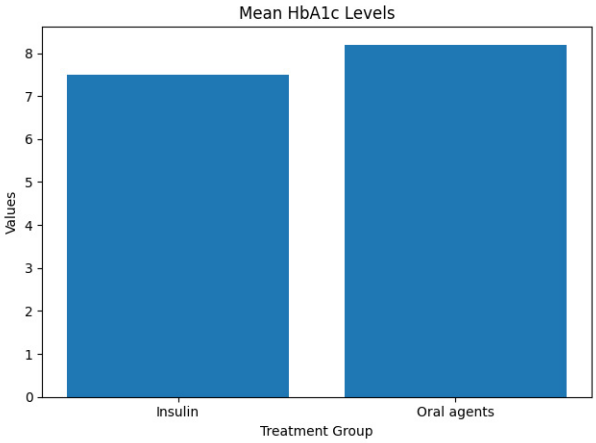

Figure 2: Mean HbA1c levels

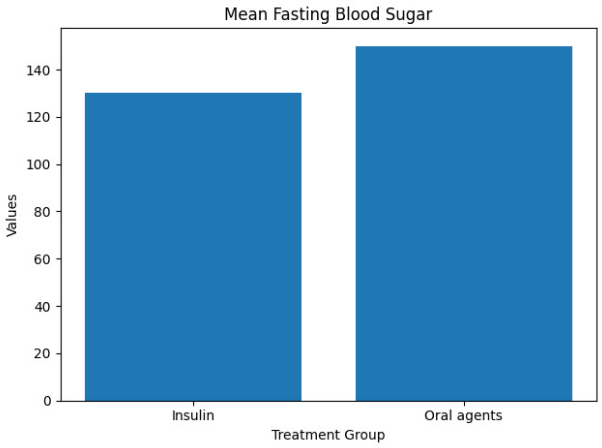

Figure 3: Mean fasting blood sugar

Table 1: Baseline Characteristics

Variable	*Monotherapy*	*Combination*	*p-value*
Age (mean ± SD)	53 ± 9	55 ± 10	0.30
Male (%)	58%	60%	0.75
BMI (mean ± SD)	27 ± 3	29 ± 4	0.04

Table 2: Glycemic Parameters

Parameter	*Monotherapy*	*Combination*	*p-value*
HbA1c	7.8	7.2	0.02
FBS	140	125	0.01
PPBS	190	170	0.03

Table 3: Clinical Outcomes

Outcome	*Monotherapy (%)*	*Combination (%)*	*p-value*
Good control	50	70	0.01
GI side effects	12	18	0.20
Hospitalization	10	12	0.50

attributed to the complementary mechanisms of action of different antidiabetic agents. While metformin reduces hepatic glucose production and improves insulin sensitivity, additional agents target insulin secretion, glucose reabsorption, or incretin pathways, resulting in enhanced glycemic control(8).

The significantly higher proportion of patients achieving good glycemic control in the combination group underscores the importance of early treatment intensification. Delayed escalation of therapy in patients inadequately controlled on monotherapy may contribute to prolonged hyperglycemia and increased risk of complications(9). Although gastrointestinal side effects were slightly more frequent in the combination group, the difference was not statistically significant. Metformin itself is known to cause gastrointestinal intolerance, and the addition of other agents may contribute to this effect. However, the benefits of improved glycemic control appear to outweigh these mild adverse effects(10).

Interestingly, hospitalization rates did not differ significantly between the two groups, suggesting that short-term clinical outcomes may not be solely dependent on glycemic parameters. Other factors such as comorbid conditions and healthcare access may play a role. Baseline characteristics were largely comparable, although BMI was significantly higher in the combination group. This may indicate that patients with higher metabolic risk are more likely to require combination therapy(11).

The study has limitations, including its retrospective design, limited sample size, and lack of data on medication adherence and duration of diabetes. Despite these limitations, the study provides valuable insights into routine clinical practice(12). Overall, the findings support current guidelines recommending early combination therapy in patients who fail to achieve glycemic targets with metformin alone. Personalized treatment strategies are essential to optimize outcomes and minimize adverse effects(13).

Conclusion

Metformin-based combination therapy is more effective than monotherapy in achieving glycaemic control in patients with Type 2 Diabetes Mellitus. Patients on combination regimens demonstrated significantly lower HbA1c and blood glucose levels and a higher rate of good glycemic control. Although mild gastrointestinal side effects were slightly increased, they were not clinically significant. These findings support early treatment intensification in patients inadequately controlled on metformin alone. Individualized therapy, considering patient characteristics and risk factors, is essential for optimizing diabetes management and improving long-term outcomes.

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