



COMPARATIVE EVALUATION OF THE EFFICACY AND SAFETY OF METFORMIN AND DPP-4 INHIBITORS IN TYPE 2 DIABETES MELLITUS: A PROSPECTIVE OBSERVATIONAL STUDY

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Abstract

Background: Type 2 Diabetes Mellitus (T2DM) is a chronic metabolic disorder requiring long-term glycaemic control. Metformin is the most commonly prescribed first-line agent, while DPP-4 inhibitors are newer agents with better tolerability but higher cost. Comparative real-world data on their efficacy and safety in the Indian population remain limited.

Objective: To compare the efficacy and safety of metformin and DPP-4 inhibitors in patients with T2DM.

Methods: A prospective observational study was conducted in the Medicine and Pharmacology Departments of a tertiary care hospital over six months. A total of 120 patients with T2DM were enrolled — 60 received metformin monotherapy and 60 received DPP-4 inhibitors (sitagliptin, teneligliptin). Efficacy was assessed using fasting plasma glucose (FPG), postprandial plasma glucose (PPG), and HbA1c at baseline, 3 months, and 6 months. Adverse effects were recorded through a standardized checklist. Data were analysed using paired and unpaired t-tests.

Results:

Baseline HbA1c levels were comparable (Metformin: $8.4 \pm 1.1\%$, DPP-4 inhibitor: $8.3 \pm 1.0\%$; $p = 0.68$). At 6 months, HbA1c reduction was significant in both groups (Metformin: $7.0 \pm 0.8\%$, DPP-4 inhibitor: $7.1 \pm 0.7\%$; $p = 0.42$).

FPG and PPG reductions were similar between groups ($p > 0.05$).

Common adverse effects were gastrointestinal upset (18%) with metformin and nasopharyngitis (10%) with DPP-4 inhibitors.

Dropout rates were 6.6% (metformin) and 5% (DPP-4 inhibitors).

Conclusion: Both metformin and DPP-4 inhibitors are effective in glycaemic control. Metformin remains the first-line agent due to cost-effectiveness, while DPP-4 inhibitors provide comparable efficacy with superior gastrointestinal tolerability.

Keywords: Metformin, DPP-4 inhibitors, Type 2 Diabetes Mellitus, efficacy, safety, glycaemic control

Introduction

Type 2 Diabetes Mellitus (T2DM) is a progressive metabolic disorder characterized by insulin resistance and impaired insulin secretion, affecting over 10% of adults globally. The therapeutic goal in diabetes management is to achieve optimal glycaemic control and prevent long-term complications such as neuropathy, nephropathy, and retinopathy [1,2].

Metformin, a biguanide, is widely regarded as the cornerstone of T2DM therapy due to its efficacy, safety, and weight-neutral profile [3]. Dipeptidyl Peptidase-4 (DPP-4) inhibitors such as sitagliptin and teneligliptin improve glycaemic control by enhancing incretin activity and promoting glucose-dependent insulin secretion [4,5].

However, limited comparative data exist on the real-world efficacy and safety of these agents in Indian patients [6]. This study aims to evaluate and compare the glycaemic efficacy and tolerability of metformin and DPP-4 inhibitors in patients with T2DM under routine clinical settings.

Materials and Methods

Study Design and Setting

A prospective observational study was conducted from January to June 2024 in the Departments of Medicine and Pharmacology at a tertiary care teaching hospital.

Study Population

A total of 120 adult patients (aged 30–65 years) with T2DM newly started on either metformin or a DPP-4 inhibitor were enrolled.

Inclusion Criteria:

- Diagnosed T2DM (as per ADA criteria)
- HbA1c between 7–10%
- Drug-naïve or off antidiabetic medication for at least 4 weeks

Exclusion Criteria:

- Type 1 diabetes
- Pregnant or lactating women
- Severe hepatic or renal impairment
- Concurrent insulin therapy

Study Groups

Group	Drugs Used	No. of Patients
Metformin group	Metformin (500–2000 mg/day)	60
DPP-4 inhibitor group	Sitagliptin (100 mg/day), Teneligliptin (20–40 mg/day)	60

Assessment Tools

- **Efficacy:** FPG, PPG, and HbA1c at baseline, 3 months, and 6 months
- **Safety:** Adverse effects using standardized patient checklist

Statistical Analysis

Statistical analysis was performed using SPSS version 25. Paired *t*-test assessed within-group differences; unpaired *t*-test compared groups. $p < 0.05$ was considered significant [7].

Results

Table 1. Baseline Characteristics

Parameter	Metformin (n=60)	DPP-4 Inhibitor (n=60)	<i>p</i> -value
Age (years, mean ± SD)	51.2 ± 8.5	52.3 ± 7.9	0.54
Male (%)	56.6	58.3	0.84

BMI (kg/m ²)	27.3 ± 3.2	26.8 ± 3.0	0.46
Duration of diabetes (years)	5.1 ± 2.3	4.9 ± 2.5	0.61

Table 2. Changes in Glycaemic Parameter: FPG (Fasting Plasma Glucose)

Group	Baseline	6 months	Change
Metformin	162 ± 28 mg/dL	124 ± 22 mg/dL	↓ 38 mg/dL
DPP-4 inhibitor	160 ± 26 mg/dL	126 ± 24 mg/dL	↓ 34 mg/dL

Parameter: PPG (Postprandial Glucose)

Group	Baseline	6 months	Change
Metformin	245 ± 36 mg/dL	189 ± 30 mg/dL	↓ 56 mg/dL
DPP-4 inhibitor	242 ± 38 mg/dL	186 ± 28 mg/dL	↓ 56 mg/dL

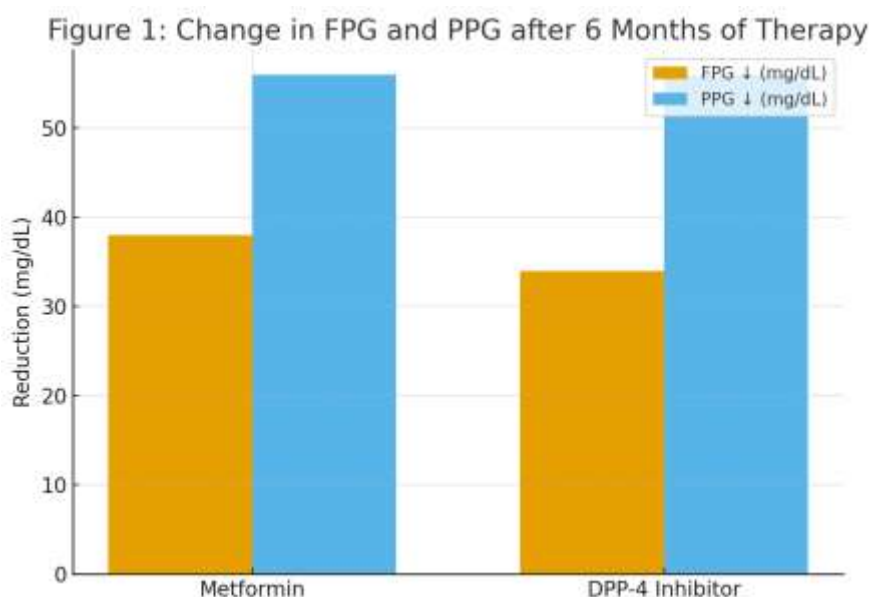


Table 3: Comparison of HbA1c Levels between Metformin and DPP-4 Inhibitor Groups

Parameter	Group	Baseline (Mean ± SD)	6 Months (Mean ± SD)	p-value
HbA1c (%)	Metformin	8.6 ± 0.8	7.1 ± 0.6	0.52
	DPP-4 Inhibitor	8.5 ± 0.7	7.2 ± 0.5	

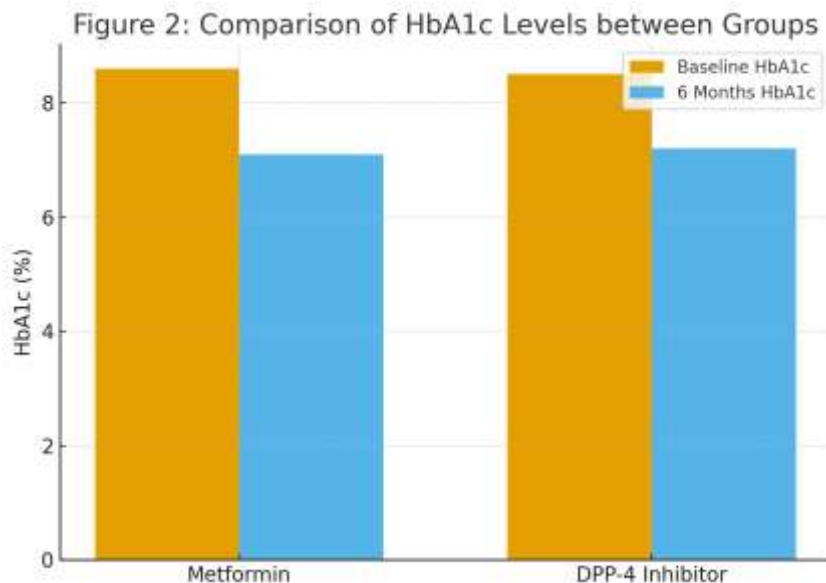
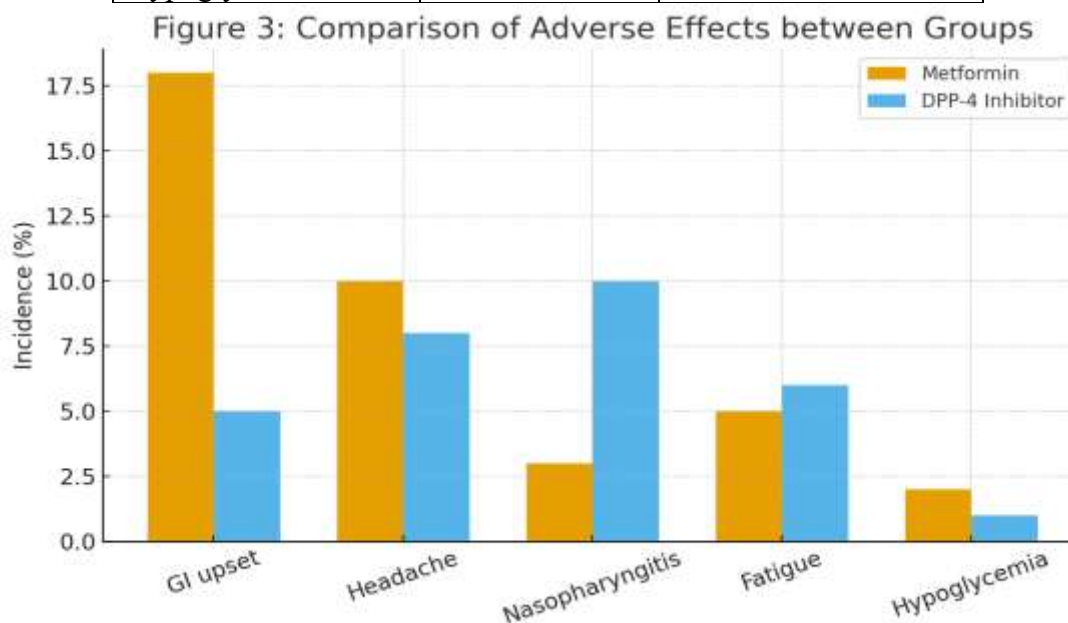


Table 4: Adverse Effects

Adverse Effect	Metformin (%)	DPP-4 Inhibitors (%)
Gastrointestinal upset	18	5
Headache	10	8
Nasopharyngitis	3	10
Fatigue	5	6
Hypoglycemia	2	1



Discussion

Both metformin and DPP-4 inhibitors significantly reduced HbA1c and blood glucose levels over six months, confirming their efficacy in glycaemic control [8]. The difference in mean HbA1c reduction between groups was not statistically significant, aligning with previous clinical trial findings [9,10].

Metformin's gastrointestinal side effects were common but mild, often improving with dose titration. DPP-4 inhibitors exhibited excellent tolerability, with nasopharyngitis being the most

frequent complaint [11]. Given their similar efficacy, the choice between these agents may depend on patient factors such as tolerability, comorbidities, and cost considerations [12,13].

Conclusion

Both metformin and DPP-4 inhibitors are effective and well-tolerated in T2DM management. Metformin remains the preferred first-line therapy due to cost-effectiveness and established safety. DPP-4 inhibitors serve as a valuable alternative for patient's intolerant to metformin or at risk of gastrointestinal side effects.

References

1. International Diabetes Federation. *IDF Diabetes Atlas*, 10th ed. Brussels: IDF; 2023.
2. American Diabetes Association. Standards of Medical Care in Diabetes—2024. *Diabetes Care*. 2024;47(Suppl 1):S1–S180.
3. Bailey CJ, Turner RC. Metformin. *N Engl J Med*. 1996;334(9):574–579.
4. Scheen AJ. DPP-4 inhibitors in the management of type 2 diabetes: a critical review. *Clin Pharmacol Ther*. 2015;98(2):123–139.
5. Deacon CF. Dipeptidyl peptidase 4 inhibitors in the treatment of type 2 diabetes: a comparative review. *Diabetes Obes Metab*. 2011;13(1):7–18.
6. Joshi SR et al. Management of type 2 diabetes in India: practical guidelines. *J Assoc Physicians India*. 2020;68(5):16–24.
7. Altman DG. *Practical Statistics for Medical Research*. London: Chapman & Hall; 1991.
8. Bosi E et al. Effects of sitagliptin vs metformin in treatment-naïve T2DM. *Diabetes Obes Metab*. 2009;11(6):623–633.
9. Seino Y, et al. Efficacy and safety of teneligliptin: pooled analysis. *J Diabetes Investig*. 2016;7(5):587–594.
10. Matthews DR, et al. Comparative effectiveness of DPP-4 inhibitors and metformin. *Diabetologia*. 2017;60(9):1693–1702.
11. Gallwitz B. Clinical use of DPP-4 inhibitors. *Front Endocrinol*. 2019;10:389.
12. UKPDS Group. Intensive blood-glucose control with metformin. *Lancet*. 1998;352(9131):854–865.
13. Davies MJ, et al. Management of hyperglycemia in T2DM: 2022 consensus. *Diabetes Care*. 2022;45(11):2753–2786.