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# A Comparative Study on the Therapeutic Effectiveness and Safety of Escitalopram and Desvenlafaxine in Patients of Type 2 Diabetes Mellitus with Depression at A Tertiary Care Teaching Hospital

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## ABSTRACT

**Background:** Depression is a common comorbidity in patients with Type 2 Diabetes Mellitus (T2DM) and is associated with poor glycemic control, reduced treatment adherence, and diminished quality of life. Escitalopram and desvenlafaxine are commonly prescribed antidepressants; however, comparative data regarding their effectiveness and safety in diabetic patients with depression are limited.

**Objective:** To compare the therapeutic effectiveness and safety of escitalopram and desvenlafaxine in patients with T2DM with Depression.

**Materials and Methods:** This prospective, observational, comparative study was conducted in the Departments of Pharmacology, Medicine, and Psychiatry at G.S.V.M. Medical College and L.L.R. Hospital, Kanpur, over 18 months. A total of 73 eligible patients with T2DM and depression were enrolled and followed for 12 weeks. Patients received either desvenlafaxine (n=35) or escitalopram (n=38) as prescribed by the treating physician. Depression severity was assessed using the Hamilton Depression Rating Scale (HDRS), while glycemic control was evaluated using fasting plasma glucose (FPG) and glycated haemoglobin (HbA1c). Adverse drug reactions (ADRs) were assessed using the Naranjo ADR Probability Scale and Modified Hartwig Severity Scale.

**Results:** Final analysis included 32 patients in the desvenlafaxine group and 36 patients in the escitalopram group. Both groups demonstrated significant reductions in HDRS scores over 12 weeks. The reduction was significantly greater in the desvenlafaxine group (HDRS: 25.1 ± 6.4 to 11.2 ± 4.7) compared to the escitalopram group (25.8 ± 6.8 to 14.6 ± 5.3) ($p<0.05$). Significant improvements in FPG and HbA1c were observed in both groups ($p<0.001$), with no statistically significant difference between treatments. Adverse drug reactions were infrequent and mild, occurring in one patient in each group. No serious adverse events were reported.

**Conclusion:** Both escitalopram and desvenlafaxine were effective and well tolerated in patients with T2DM and depression. Desvenlafaxine demonstrated superior antidepressant efficacy, while both drugs showed comparable benefits in glycemic control and safety.

***Keywords****: Type 2 Diabetes Mellitus, Depression, Escitalopram, Desvenlafaxine, Hamilton Depression Rating Scale, Glycemic Control, Adverse Drug Reactions.*

## INTRODUCTION

Type 2 Diabetes Mellitus (T2DM) is one of the most prevalent chronic metabolic disorders worldwide and represents a major public health challenge. The disease is characterized by insulin resistance, progressive β-cell dysfunction, and chronic hyperglycemia, leading to significant microvascular and macrovascular complications. According to the International Diabetes Federation, the global burden of diabetes continues to rise, particularly in developing countries such as India, which is often referred to as the "diabetes capital of the world" due to its large affected population [1].

Depression is a common psychiatric comorbidity among patients with T2DM, with prevalence estimates ranging from 15% to 30%, significantly higher than those observed in the general population [2]. The relationship between diabetes and depression is bidirectional. Depression adversely affects self-care behaviors, medication adherence, dietary practices, and physical activity, resulting in poor glycemic control and increased risk of diabetic complications. Conversely, the chronic burden of diabetes and its complications may contribute to the development of depressive symptoms [3,4].

The coexistence of depression and T2DM has been associated with reduced quality of life, increased healthcare utilization, higher treatment costs, and increased mortality [5]. Therefore, early identification and effective management of depression in diabetic patients are essential components of comprehensive diabetes care.

Selective Serotonin Reuptake Inhibitors (SSRIs) are frequently used as first-line agents for the treatment of depression because of their favorable efficacy and safety profiles. Escitalopram, one of the most commonly prescribed SSRIs, has demonstrated significant antidepressant efficacy with good tolerability in various patient populations [6]. Some studies have also suggested that escitalopram may improve glycemic control through better mood stabilization and improved adherence to diabetes management [7].

Desvenlafaxine, a Serotonin-Norepinephrine Reuptake Inhibitor (SNRI), is another effective antidepressant approved for the treatment of major depressive disorder. By enhancing both serotonergic and noradrenergic neurotransmission, desvenlafaxine may offer advantages in patients with moderate to severe depression and has been shown to produce significant improvements in depressive symptoms with a favourable safety profile [8,9].

Although both escitalopram and desvenlafaxine are widely prescribed, limited data are available comparing their therapeutic effectiveness and safety specifically in patients with T2DM and comorbid depression. Furthermore, the influence of these antidepressants on glycemic parameters remains an area of clinical interest. Therefore, the present study was undertaken to compare the therapeutic effectiveness and safety of escitalopram and desvenlafaxine in patients with Type 2 Diabetes Mellitus and depression attending a tertiary care teaching hospital.

## MATERIALS AND METHODS

### Study Design and Setting

This prospective, observational, comparative study was conducted in the Department of Pharmacology in collaboration with the Departments of Medicine and Psychiatry at G.S.V.M. Medical College and associated L.L.R. Hospital, Kanpur, Uttar Pradesh, India. The study was undertaken over a period of 18 months. The primary objective was to assess and compare the therapeutic effectiveness and safety of escitalopram and desvenlafaxine in patients with Type 2 Diabetes Mellitus (T2DM) and comorbid depression. Eligible patients attending the outpatient departments were screened and recruited consecutively. Each participant was followed for a period of 12 weeks.

### Study Population

The study population consisted of adult patients diagnosed with T2DM and depression attending the outpatient services of the Departments of Medicine and Psychiatry.

### Inclusion Criteria

- Patients aged **18 years or older**.
- Diagnosed with **Type 2 Diabetes Mellitus (T2DM)** according to **American Diabetes Association (ADA)** guidelines.
- Diagnosed with **depression** according to **DSM-5 criteria**.
- Receiving either **escitalopram** or **desvenlafaxine** as part of routine clinical Treatment.
- Willing to provide **written informed consent**.

### Exclusion Criteria

- Patients with **Type 1 Diabetes Mellitus (T1DM)**.
- Presence of severe psychiatric disorders other than depression (e.g., **schizophrenia** or **bipolar disorder**).
- **Pregnant or lactating** women.
- Patients unwilling or unable to provide **written informed consent**.

**Sample Size and Sampling Technique**
The sample size was calculated using the Taro Yamane formula for finite populations with a 95% confidence level and a margin of error of 5%. Based on an estimated eligible population of 76 patients, the minimum required sample size was calculated to be 64 participants. However, a total of 73 eligible patients were enrolled during the study period using a consecutive sampling technique.

Participants were categorized into two groups according to the antidepressant prescribed by the treating physician. The desvenlafaxine group consisted of 35 patients, while the escitalopram group comprised 38 patients.

**Data Collection and Study Assessments**
Data were collected using a structured and standardized case record form. Demographic information including age, sex, and socioeconomic status, as well as clinical details such as duration of diabetes, duration of depression, and treatment history, were recorded at baseline.

**Assessment of Depression Severity**
Depression severity was evaluated using the Hamilton Depression Rating Scale (HDRS), a validated clinician-administered instrument. HDRS assessments were performed at baseline, 6 weeks, and 12 weeks. Reduction in HDRS scores was considered indicative of improvement in depressive symptoms.

**Assessment of Glycemic Control**
Glycemic control was assessed using fasting plasma glucose (FPG) and glycated hemoglobin (HbA1c) levels. Measurements were recorded at baseline, 6 weeks, and 12 weeks to evaluate short-term and long-term glycemic status.

**Safety Assessment**
Safety evaluation was carried out through active monitoring of adverse drug reactions (ADRs) throughout the study period. Causality assessment of ADRs was performed using the Naranjo Adverse Drug Reaction Probability Scale, while severity assessment was conducted using the Modified Hartwig Severity Scale.

**Follow-up Procedure**
After enrollment and baseline assessment, participants were followed up at 6 weeks and 12 weeks. At each follow-up visit, HDRS scores, glycemic parameters (FPG and HbA1c), and adverse drug reactions were recorded. Data were documented in real time, and periodic verification was undertaken to ensure completeness and accuracy.

**Ethical Considerations**
The study protocol was approved by the Institutional Ethics Committee prior to commencement. Written informed consent was obtained from all participants before enrollment. Participants were informed about the objectives and procedures of the study and were assured of their right to withdraw at any stage without affecting their routine medical care. Confidentiality and anonymity of all patient information were strictly maintained.

**Statistical Analysis**
Data were entered into Microsoft Excel and analyzed using Statistical Package for the Social Sciences (SPSS) software. Continuous variables were expressed as mean ± standard deviation (SD), while categorical variables were presented as frequencies and percentages. Comparisons between the two treatment groups were performed using the independent samples t-test. Within-group changes over time were analyzed using the paired t-test. Categorical variables were compared using the Chi-square test. A p-value of less than 0.05 was considered statistically significant.

**RESULTS AND OBSERVATIONS;**
**Patient Characteristics**
A total of 73 patients were enrolled in the study, including 35 patients in the Desvenlafaxine group and 38 patients in the Escitalopram group. During follow-up, three patients from the Desvenlafaxine group and two patients from the Escitalopram group were lost to follow-up. Therefore, the final analysis included 32 patients in the Desvenlafaxine group and 36 patients in the Escitalopram group.

**Table 1. Baseline Demographic and Clinical Characteristics of Study Participants**

| Parameter | Desvenlafaxine (n=32) | Escitalopram (n=36) | p-value |
|---|---|---|---|
| Age (years), Mean ± SD | 51.2 ± 9.6 | 53.8 ± 10.4 | >0.05 |
| Male, n (%) | 15 (46.9) | 19 (52.8) | >0.05 |
| Female, n (%) | 17 (53.1) | 17 (47.2) | >0.05 |
| Duration of Depression (months), Mean ± SD | 7.5 ± 3.8 | 8.3 ± 4.1 | 0.41 |
| Duration of Diabetes (years), Mean ± SD | 2.4 ± 1.6 | 2.7 ± 1.8 | 0.47 |

The baseline demographic and clinical characteristics were comparable between the two groups, with no statistically significant differences observed.

**Table 2. Socioeconomic Status and Anti-diabetic Therapy Pattern**

| Parameter | Desvenlafaxine (n=32) | Escitalopram (n=36) | p-value |
|---|---|---|---|
| **Socioeconomic Status** | | | 0.81 |
| Upper Middle | 4 (12.5%) | 6 (16.7%) | |
| Lower Middle | 24 (75.0%) | 25 (69.4%) | |
| Upper Lower | 4 (12.5%) | 5 (13.9%) | |
| **Anti-diabetic Therapy** | | | 0.64 |
| Monotherapy | 7 (21.9%) | 5 (13.9%) | |
| Dual Therapy | 18 (56.3%) | 24 (66.7%) | |
| Triple Therapy | 7 (21.9%) | 7 (19.4%) | |

The majority of patients belonged to the lower-middle socioeconomic class. Dual anti-diabetic therapy was the most commonly prescribed regimen in both groups.

**Efficacy Outcomes**

**Table 3. Comparison of HDRS Scores During Follow-up**

| Time Point | Desvenlafaxine (Mean ± SD) | Escitalopram (Mean ± SD) | p-value |
|---|---|---|---|
| Baseline | 25.1 ± 6.4 | 25.8 ± 6.8 | >0.05 |
| 6 Weeks | 15.4 ± 5.6 | 18.1 ± 6.2 | <0.05 |
| 12 Weeks | 11.2 ± 4.7 | 14.6 ± 5.3 | <0.05 |

Both groups demonstrated significant reductions in HDRS scores over the 12-week follow-up period. However, the reduction was significantly greater in the Desvenlafaxine group, indicating superior antidepressant efficacy.

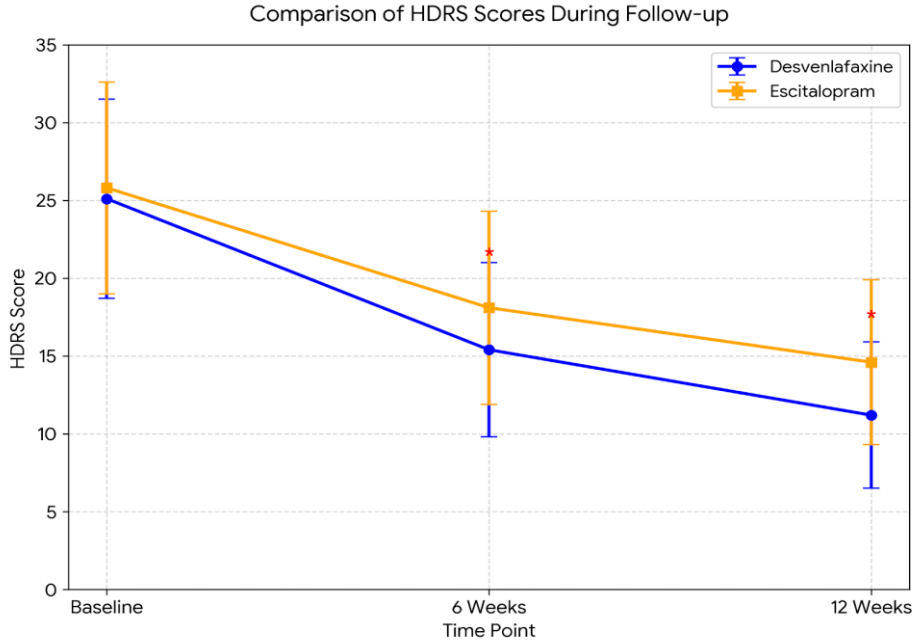



**Table 4. Comparison of Fasting Plasma Glucose (FPG) Levels During Follow-up**

| Time Point | Desvenlafaxine (Mean ± SD) | Escitalopram (Mean ± SD) | p-value |
|---|---|---|---|
| Baseline | 235.6 ± 84.2 | 248.9 ± 88.5 | >0.05 |
| 6 Weeks | 180.4 ± 69.3 | 201.2 ± 72.6 | >0.05 |
| 12 Weeks | 140.8 ± 56.9 | 167.5 ± 61.4 | 0.795 |

Both treatment groups exhibited highly significant reductions in fasting plasma glucose levels from baseline to 12 weeks ($p<0.001$ within groups). No significant difference was observed between groups.

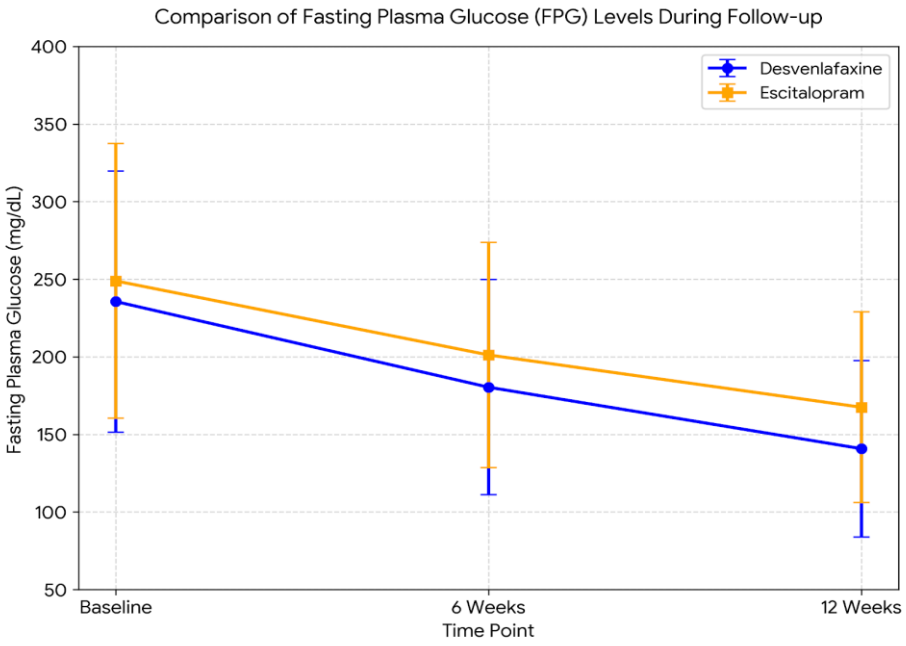
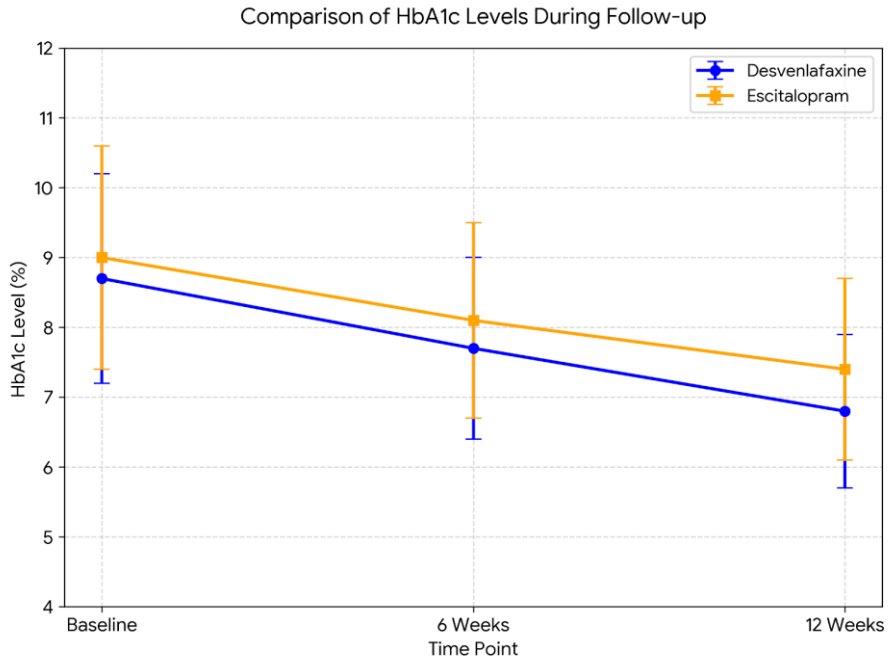



**Table 5. Comparison of HbA1c Levels During Follow-up**

| Time Point | Desvenlafaxine (Mean ± SD) | Escitalopram (Mean ± SD) | p-value |
|---|---|---|---|
| Baseline | 8.7 ± 1.5 | 9.0 ± 1.6 | >0.05 |
| 6 Weeks | 7.7 ± 1.3 | 8.1 ± 1.4 | >0.05 |
| 12 Weeks | 6.8 ± 1.1 | 7.4 ± 1.3 | 0.590 |

Both groups showed significant improvement in long-term glycemic control over the study period ($p<0.001$ within groups). However, no statistically significant difference was observed between the two treatment groups.




**Safety Outcomes**

**Table 6. Comparison of Adverse Drug Reactions and Safety Assessment**

| Parameter | Desvenlafaxine (n=32) | Escitalopram (n=36) |
|---|---|---|
| Patients with ADRs, n (%) | 1 (3.2%) | 1 (3.5%) |
| Type of ADR | Constipation | Somnolence |
| System Involved | Gastrointestinal | Central Nervous System |
| Naranjo Causality Assessment | Probable | Probable |
| Hartwig Severity Level | Mild (Level 1) | Mild (Level 1) |
| Serious ADRs | None | None |

Only one mild adverse drug reaction was reported in each treatment group. Both reactions were classified as probable according to the Naranjo scale and mild according to the Modified Hartwig scale. No serious adverse events were observed, indicating that both medications were generally well tolerated.

## DISCUSSION

The present prospective observational study compared the therapeutic effectiveness and safety of escitalopram and desvenlafaxine in patients with Type 2 Diabetes Mellitus and comorbid depression over a follow-up period of 12 weeks. The baseline demographic and clinical characteristics, including age, gender distribution, duration of depression, duration of diabetes, socioeconomic status, and antidiabetic therapy patterns, were comparable between the two treatment groups. The absence of statistically significant baseline differences suggests that both groups were well matched and suitable for comparative analysis.

Depression severity was assessed using the Hamilton Depression Rating Scale (HDRS). Both escitalopram and desvenlafaxine produced significant reductions in HDRS scores from baseline to 12 weeks, indicating substantial improvement in depressive symptoms. However, the reduction in HDRS scores was significantly greater in the desvenlafaxine group compared with the escitalopram group. These findings are consistent with previous studies reporting superior efficacy of serotonin-norepinephrine reuptake inhibitors in achieving remission and reducing depressive symptoms, particularly in patients with moderate to severe depression [10,11]. The dual mechanism of action of desvenlafaxine may provide a broader neurotransmitter modulation, contributing to enhanced antidepressant efficacy.
Glycemic control was evaluated using fasting plasma glucose (FPG) and HbA1c levels. Both treatment groups demonstrated significant improvements in glycemic parameters during follow-up. FPG and HbA1c values decreased significantly from baseline in both groups, indicating that effective treatment of depression may positively influence diabetes management. Improved mood and psychological well-being are known to enhance medication adherence, dietary compliance, and self-care behaviors, which ultimately contribute to better glycemic outcomes [12,13].

Although the desvenlafaxine group demonstrated numerically lower FPG and HbA1c values at the end of the study period, the differences between the two groups were not statistically significant. These findings suggest that both antidepressants exert comparable effects on glycemic control. Similar observations have been reported by previous investigators who found that successful treatment of depression, irrespective of the specific antidepressant used, may result in improved metabolic outcomes in diabetic patients [14].

Safety evaluation revealed a low incidence of adverse drug reactions in both groups. Only one patient in each treatment group experienced an adverse event. Constipation was reported in the desvenlafaxine group, whereas somnolence was observed in the escitalopram group. Both adverse reactions were classified as probable according to the Naranjo ADR Probability Scale and mild according to the Modified Hartwig Severity Scale. No serious adverse events, treatment discontinuations, or hospitalisations related to adverse drug reactions were observed. These findings are in agreement with previous studies demonstrating the favourable tolerability profiles of both escitalopram and desvenlafaxine [15,16].

The study has certain limitations. The sample size was relatively small, and the follow-up duration was limited to 12 weeks. The observational design may also introduce potential confounding factors that could not be completely controlled. Larger randomised controlled trials with longer follow-up periods are required to further evaluate the comparative effects of these antidepressants on both depressive symptoms and metabolic outcomes in patients with T2DM.

Overall, the findings of the present study indicate that both escitalopram and desvenlafaxine are effective and safe treatment options for depression in patients with Type 2 Diabetes Mellitus. However, desvenlafaxine demonstrated superior improvement in depressive symptoms, while both medications showed comparable benefits regarding glycemic control and safety.

## CONCLUSION

Both escitalopram and desvenlafaxine were effective and well-tolerated in the treatment of depression among patients with Type 2 Diabetes Mellitus. Significant improvement in depressive symptoms, fasting plasma glucose, and HbA1c levels was observed in both groups over the 12-week follow-up period. However, desvenlafaxine demonstrated a greater reduction in HDRS scores, suggesting superior antidepressant efficacy. The incidence of adverse drug reactions was low and comparable between the two treatment groups. Thus, both drugs appear to be safe and effective treatment options, with desvenlafaxine showing a potential advantage in improving depressive symptoms.

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