Research Article

Prevalence and Risk Factors of Depression among Patients with Type 2 Diabetes

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ABSTRACT

Background: Diabetes mellitus (DM) is a major public health issue on a global scale. The present study was conducted to assess risk factors and prevalence of depression in T2DM patients.
Materials & Methods: 120 type II diabetes mellitus patients of both genders were selected. The Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5) criteria were used to determine whether depression was present.
Results: Out of 120 patients, 70 were males and 50 were females. Smoking was seen in 14 and 32, alcoholism in 6 and 14, duration of DM was 15.2 years and 14.3 years, family history of T2DM was seen in 7 and 18, insulin therapy was seen in 14 and 20 and type of family was joint: nuclear seen in 32:20 in patients with depression and 35:33 in patients without depression respectively. The difference was significant (P< 0.05). The mean HbA1c was 9.4% and 8.2%, FPG was 204.6 gm/dL and 196.4 gm/dL, PPG was 280.2 gm/dL and 232.5 gm/dL, and hemoglobin was 10.2 gm/dL and 11.6 gm/dL in patients with depression and without depression. The difference was significant (P< 0.05).
Conclusion: The majority of patients suffered from depression. Alcoholism, smoking, and a family history of diabetes mellitus were risk factors.

Keywords: Alcoholism, Smoking, Diabetes Mellitus, Depression.

INTRODUCTION

Diabetes mellitus (DM) is a major public health issue on a global scale. According to recent figures, 7.3% of Indians have diabetes mellitus. Mental health problems are more common in those with diabetes mellitus. Depression is twice as common in those with diabetes mellitus as it is in the general population. Interestingly, there is a unique reciprocal association between diabetes and depression.[1] Diabetes may raise a person's risk of developing depression because of a reduced quality of life; the financial burden of managing a chronic progressive illness; the disabilities brought on by micro and macrovascular diabetic complications; and changes in the brain's neurohormones and neurotransmitters associated with diabetes.[2] In people with established diabetes mellitus, depression is associated with higher blood glucose levels.[3] Depression patients may find it more difficult to maintain glycaemic control due to hormonal changes, decreased physical activity, diminished desire and self-care habits, and poor adherence to medical medication. Depression is also associated with an increased risk of complications and diabetes-related death. Therefore, depression could be a hindrance to properly managing diabetes mellitus.[4] Studies conducted in India have shown that between 8 and 84% of people with type 2 diabetes have depression. Additionally, there has been a lot of variation in this study on the risk variables for depression in individuals with type 2 diabetes.[5,6]

Aim & Objectives
Aim: To assess the Prevalence and risk factors of depression among patients with type 2 diabetes and to evaluate associated socio-demographic, lifestyle, and clinical parameters.

Objectives
* To determine the prevalence of depression among patients with T2DM.
* To evaluate the association between socio-demographic factors (gender, smoking, alcohol consumption, family type, and family history of diabetes) and depression in T2DM patients.
* To assess lifestyle-related risk factors, including smoking, alcohol consumption, and insulin therapy, in relation to depression.
* To analyze key clinical parameters (HbA1c, fasting plasma glucose, postprandial glucose, and hemoglobin levels) among depressed and non-depressed T2DM patients.

- To identify potential predictors of depression in T2DM patients.

MATERIALS & METHODS

Study Design

This was a cross-sectional observational study conducted to assess the prevalence, severity, and risk factors of depression in patients with Type 2 Diabetes Mellitus (T2DM). The study involved clinical, biochemical, and psychiatric evaluations of the participants.

Study Population

The study included 120 patients diagnosed with Type 2 Diabetes Mellitus of both genders. Participants were recruited from both inpatient and outpatient departments. All participants provided written informed consent prior to inclusion in the study.

Study Place

The study was conducted in the Department of General Medicine at JIET Medical College & Hospital, Jodhpur, India equipped with NABL-certified laboratory facilities for biochemical investigations and specialized departments for diabetes management and ophthalmology assessment.

Study Period

The study was carried out over a period of eight months, from October 2023 to May 2024.

Ethical Considerations

The study protocol was approved by the Institutional Ethics Committee. Written informed consent was obtained from all participants. The study adhered to the ethical principles outlined in the Declaration of Helsinki. Patient confidentiality and anonymity were strictly maintained.

Inclusion Criteria

- Patients diagnosed with Type 2 Diabetes Mellitus.
- Age ≥18 years.
- Both inpatients and outpatients.

Exclusion Criteria

- Patients previously diagnosed with major psychiatric disorders or receiving antidepressants.
- Critically ill patients or those with altered sensorium.
- Pregnant women.
- Patients with HIV infection, tuberculosis, chronic liver disease, or malignancy.

Study Procedure

1. **Data Collection:** Demographic data including name, age, and gender were recorded.
2. **Depression Assessment:**
- Diagnosis of depression was made using DSM-5 criteria. Patients were considered to have depression if they exhibited at least five of eight specified symptoms over the same two-week period, with at least one being depressed mood or loss of interest.
- Severity of depression was assessed using the Hamilton Depression Rating Scale (HAM-D), a 17-item questionnaire with item scores ranging from 0–2 (eight items) and 0–4 (nine items). Depression severity was classified as follows:
- Mild: 8–13
- Moderate: 14–18
- Severe: 19–22
- Extremely severe: ≥23

3. **Clinical Examination:** All participants underwent physical examinations and were evaluated for complications including diabetic retinopathy and kidney disease.

Investigations

1. **Blood Tests:**
- Fasting Plasma Glucose (FPG) and Postprandial Plasma Glucose (PPG) measured using enzymatic hexokinase method.
- Glycated hemoglobin (HbA1c) assessed via Boronate affinity chromatography.
- Serum creatinine measured by alkaline kinetic picrate method using UniCelDxC auto-analyser.
2. **Urine Analysis:**
- Qualitative dipstick testing for proteinuria using UroColorUristix®.

3. **Ophthalmologic Evaluation:**
- Assessment for diabetic retinopathy through dilated fundoscopy.

4. **Renal Function Assessment:**
- Estimated glomerular filtration rate (eGFR) calculated using CKD-EPI equation.
- Diabetic kidney disease defined by eGFR<60 mL/min/1.73 m² with albuminuria.

Outcome Measures

1. Prevalence of depression among T2DM patients.

2. Severity of depression based on HAM-D scores.
3. Association of depression with clinical parameters including HbA1c, FPG, PPG, hemoglobin, and diabetic complications.
4. Relationship between depression and socio-demographic and lifestyle factors (smoking, alcohol use, family history, type of family, and insulin therapy).

Statistical Analysis

- Data were recorded in Microsoft Excel 2016 and analyzed using IBM SPSS Statistics Version 21.

- **Continuous Variables:** Compared using unpaired Student's t-test for normally distributed data and Mann–Whitney U test for nonparametric data.
- **Categorical Variables:** Analyzed using Chi-square or Fisher's exact test as appropriate.
- **Regression Analysis:** Binary logistic regression was performed to identify predictors of depression in T2DM patients.
- A p-value <0.05 was considered statistically significant.

RESULTS

Table 1: Distribution of Patients

Total- 120		
Gender	**Male**	**Female**
Number	70	50

Table 1 shows that out of 120 patients, 70 were males and 50 were females.

Table 2: Evaluation of Socio-Demographic Factors

Parameters	Depression (n=52)	Without depression (n=68)	P value
Smoking	14	32	0.05
Alcohol consumption	6	14	0.03
Duration of DM (years)	15.2	14.3	0.49
Family history of T2DM	7	18	0.04
Insulin therapy	14	20	0.28
Type of family (Joint: Nuclear)	32:20:00	35:33:00	0.75

Table 2 and figure I, summarizes the evaluation of socio-demographic and lifestyle factors among patients with and without depression. Smoking was more common in the depression group, with 14 patients reporting smoking compared to 32 patients in the non-depression group, showing borderline statistical significance (p = 0.05). Alcohol consumption was reported by 6 patients with depression and 14 patients without depression, indicating a significant association (p = 0.03). The mean duration of diabetes mellitus was slightly higher in the depression group (15.2 years) compared to the non-depressed group (14.3 years), but this difference was not statistically significant (p = 0.49). A positive family history of type 2 diabetes mellitus was noted in 7 patients with depression versus 18 patients without depression, showing a significant association (p = 0.04). Insulin therapy was used by 14 patients in the depression group and 20 patients in the non-depression group, with no significant difference between the groups (p = 0.28). Regarding family type, 32 patients in the depression group belonged to joint families and 20 to nuclear families, while in the non-depression group, 35 patients were from joint families and 33 from nuclear families, showing no significant difference (p = 0.75).
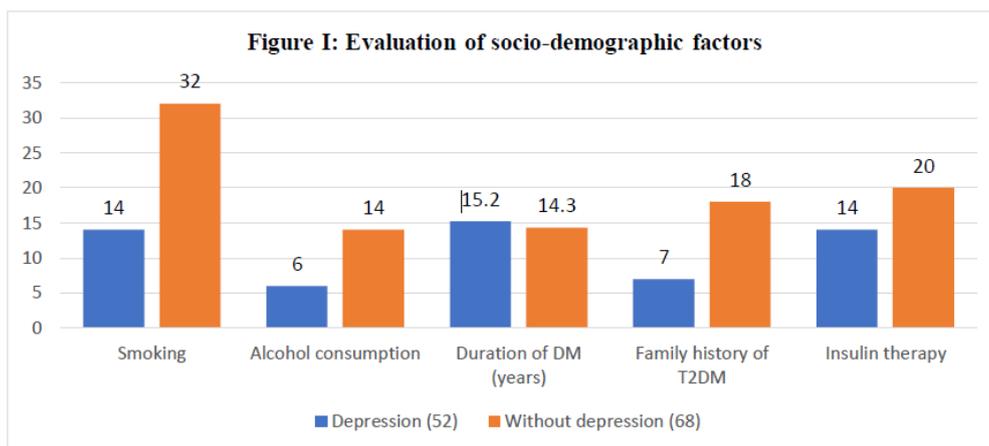
Figure I: Evaluation of socio-demographic factors

Table 3: Assessment of Clinical Parameters

Parameters	Depression(n=52) (Mean ± SD)	Without Depression(n=68) (Mean ± SD)	P value
HbA1c (%)	9.4 ± 1.2	8.2 ± 1.0	0.13
FPG (mg/dL)	204.6 ± 25.4	196.4 ± 22.1	0.05
PPG (mg/dL)	280.2 ± 30.7	232.5 ± 28.3	0.29
Haemoglobin (gm/dL)	10.2 ± 1.1	11.6 ± 1.3	0.02

Table 3 presents the assessment of key clinical parameters among patients with and without depression. The mean HbA1c level was higher in patients with depression (9.4 ± 1.2%) compared to those without depression (8.2 ± 1.0%), although this difference did not reach statistical significance (p = 0.13). Fasting plasma glucose (FPG) levels were also elevated in the depression group, with a mean of 204.6 ± 25.4 mg/dL versus 196.4 ± 22.1 mg/dL in the non-depressed group, showing borderline significance (p = 0.05). Postprandial glucose (PPG) levels were substantially higher in depressed patients (280.2 ± 30.7 mg/dL) compared to their counterparts without depression (232.5 ± 28.3 mg/dL), though this difference was not statistically significant (p = 0.29). In contrast, haemoglobin levels were significantly lower in the depression group, with a mean of 10.2 ± 1.1 gm/dL compared to 11.6 ± 1.3 gm/dL in patients without depression (p = 0.02), indicating a potential association between lower haemoglobin levels and depression in this cohort.

DISCUSSION
Depression is a common and serious comorbidity in individuals with Type 2 Diabetes Mellitus (T2DM). It affects disease management, quality of life, and clinical outcomes.[7] The relationship is bidirectional— T2DM increases the risk of developing depression, and depression raises the risk of poor glycemic control and complications in diabetes.[8] Depression is 2 to 3 times more common in patients with T2DM than in the general population. Estimates suggest up to 25–30% of T2DM patients experience depressive symptoms at some point.[9,10] The present study was conducted to assess risk factors and prevalence of depression in T2DM patients. We found that out of 120 patients, 70 were males and 50 were females. de Groot Met al.[11] examine the strength and consistency of the relationship between depression and diabetes complications in studies of type 1 and type 2 adult patients with diabetes. A total of 27 studies (total combined N = 5374) met the inclusion criteria. A significant association was found between depression and complications of diabetes (p < .00001, z = 5.94). A moderate and significant weighted effect size (r = 0.25; 95% CI: 0.22-0.28) was calculated for all studies reporting sufficient data (k = 22). Depression was significantly associated with a variety of diabetes complications (diabetic retinopathy, nephropathy, neuropathy, macrovascular complications, and sexual dysfunction). Effect sizes were in the small to moderate range (r = 0.17 to 0.32). We found that smoking was seen in 14 and 32, alcoholism in 6 and 14, duration of DM was 15.2 years and 14.3 years, family history of T2DM was seen in 7 and 18, insulin therapy was seen in 14 and 20

and type of family was joint: nuclear seen in 32:20 in patients with depression and 35:33 in patients without depression respectively. The prevalence and contributing factors of depression in individuals with type 2 diabetes (T2DM) were examined by Raval et al.[12] The nine-item PHQ-9 (Hindi version) was used to assess depression in patients with established type 2 diabetes. The relationship between predictor variables and depression risk was investigated using a binary logistic regression model. A total of 300 T2DM patients (147 (49%) men and 153 (51%) women) were assessed. Eight (4–13) years was the median duration of diabetes (IQ). Of the patients in the study, 68 (23%) had major depression, 54 (18%) had moderate depression, and the remainder 178 (59%) did not have any depression that was clinically significant. Depression was significantly linked to peripheral vascular disease (OR 6.08, 95% CI 1.07-34.6; P=0.042), diabetic foot disease (OR 2.32, 95% CI 1.06-5.86; P<0.001), central obesity (OR 1.34, 95% CI 1.04-1.64; P<0.001), neuropathy (OR 1.94, 95% CI 1.03-3.66; P=0.002), nephropathy (OR 1.81, 95% CI 1.02-3.21; P=0.041), and pill burden (>4) as well. However, the length of diabetes and insulin use did not significantly affect the incidence of depression. We found that the mean hemoglobin level in the depressed group was 10.2 ± 1.1 g/dL, significantly lower than the 11.6 ± 1.3 g/dL observed in the non-depressed group (P = 0.02). This finding aligns with previous research indicating that depression in T2DM patients is associated with lower hemoglobin levels. For instance, a study by Zhang et al. (2019) observed that depressive symptoms were linked to decreased hemoglobin levels, possibly due to factors like poor nutritional intake or chronic inflammation affecting erythropoiesis.[13] While the difference in HbA1c levels between the two groups was not statistically significant (P = 0.13), the depressed group exhibited higher HbA1c levels ($9.4 \pm 1.2\%$) compared to the non-depressed group ($8.2 \pm 1.0\%$). This trend is consistent with findings from a meta-analysis by González Heredia et al. (2020), which reported that individuals with T2DM and depression had significantly higher HbA1c levels compared to those without depression.[14] The depressed group had higher Fasting Plasma Glucose (FPG) levels (204.6 ± 25.4 mg/dL) compared to the non-depressed group (196.4 ± 22.1 mg/dL), with a P value of 0.05, approaching statistical significance. However, Postprandial Glucose (PPG) levels were not significantly different between the two groups (P = 0.29). These findings are in line with research by Pal et al. (2019), which found that depressive symptoms in T2DM patients were associated with poorer glycemic control, including higher FPG levels.[15] Rajput et al.[16] The study included 410 age and sex-matched healthy controls and 410 consecutive T2DM patients who visited the endocrine outpatient department of a Northern Indian tertiary care facility. Relevant clinical and sociodemographic data were gathered. The Hamilton Anxiety Rating Scale and the Hamilton Depression Rating Scale were used to assess their anxiety and depression, respectively. Compared to healthy controls, a considerably higher percentage of diabetic patients had anxiety (27.6% vs. 12.7%, P = 0.001), depression (26.3% vs. 11.2%, P = 0.001), and comorbid depression and anxiety (21.0% vs. 7.3%, P = 0.001). Compared to men, women with diabetes experienced higher levels of anxiety (17.6% vs. 10.0%) and depression (17.1% vs. 9.3%). Age, female sex, insulin therapy, retinopathy, nephropathy, and ischemic heart disease were the main predictors of a severe type of anxiety and sadness in T2DM patients.

Limitations of the Study

- **Sample Size:** The study included only 120 patients, which may limit the generalizability of the findings.
- **Cross-Sectional Design:** The study design limits the ability to establish causality between depression and diabetes-related factors.
- **Self-Reported Lifestyle Factors:** Information on smoking and alcohol consumption was self-reported, which may introduce recall bias.
- **Single-Centre Study:** Data were collected from a single center, which may not reflect the wider population.
- **Lack of Longitudinal Follow-Up:** The study did not assess changes in depression or glycemic control over time.

CONCLUSION

The present study found that prevalence of depression among patients with Type 2 Diabetes Mellitus. Depressed patients exhibited significantly lower hemoglobin levels, with trends toward higher HbA1c and fasting plasma glucose, suggesting an association between poor glycemic control and depression. Lifestyle factors such as smoking and alcohol

consumption, as well as family history of diabetes, showed significant associations with depression. These findings emphasize the importance of regular depression screening in T2DM patients and the integration of psychological support alongside standard diabetes management to improve overall health outcomes.

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