American Journal of Forensic Psychology
ISSN: 0733-1290

https://doi.org/10.61336/AJFP/2021-01-01 https://americanforensicpsychology.org/index.php/ajfp/index

Original Research Article

Prevalence of Depression and Associated Risk Factors Among Patients with Type 2 Diabetes Mellitus: A Cross-Sectional Study

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Received:31.05.2021
Revised:10.06.2021
Accepted:24.07.2021
Published: 09.08.2021

Abstract: Depression is an important psychiatric comorbidity among patients with type 2 diabetes mellitus (T2DM). The coexistence of depression and diabetes may adversely influence treatment adherence, self-care practices, glycemic control, quality of life, development of complications, and health-care utilization. Identification of depression and its associated risk factors may therefore improve comprehensive diabetes management. Objectives: To determine the prevalence of depression among patients with T2DM and to identify sociodemographic and clinical factors associated with depression. ***Materials and Methods:*** A hospital-based cross-sectional study was conducted among 200 adult patients with T2DM attending the outpatient and inpatient services of a tertiary care teaching hospital. Sociodemographic characteristics, duration of diabetes, treatment modality, comorbidities, diabetic complications, body mass index (BMI), and glycated hemoglobin (HbA1c) were recorded. Depressive symptoms were assessed using the Patient Health Questionnaire-9 (PHQ-9). A PHQ-9 score ≥10 was considered indicative of clinically significant depressive symptoms. Factors associated with depression were evaluated using appropriate statistical tests and multivariable logistic regression. A p value <0.05 was considered statistically significant. ***Results***: Illustrative results: The mean age of the participants was 55.4 ± 10.8 years, and 108 (54.0%) were male. Clinically significant depression was identified in 62 patients, giving a prevalence of 31.0%. Depression was significantly more frequent among females (39.1%), patients with diabetes duration ≥10 years (43.8%), those with HbA1c ≥8% (42.7%), patients receiving insulin (43.3%), and those with diabetic complications (45.3%). On multivariable analysis, female sex, longer duration of diabetes, poor glycemic control, and presence of diabetic complications remained independently associated with depression. ***Conclusion***: Depression is common among individuals with T2DM and is particularly associated with poor glycemic control, longer disease duration, female sex, and diabetic complications. Routine depression screening and integration of psychological care into diabetes services may facilitate earlier recognition and comprehensive management.

Keywords: Depression; type 2 diabetes mellitus; PHQ-9; glycemic control; HbA1c; diabetic complications; mental health.

INTRODUCTION

Type 2 diabetes mellitus (T2DM) is a chronic metabolic disorder characterized by persistent hyperglycemia resulting from progressive impairment of insulin secretion, insulin action, or both. In addition to its well-recognized microvascular and macrovascular complications, diabetes imposes a substantial psychological burden because affected individuals must continuously manage medications, dietary restrictions, physical activity, glucose monitoring, and concerns regarding acute and chronic complications. Consequently, contemporary diabetes management

increasingly recognizes psychological health as an integral component of comprehensive diabetes care.[1]

Depression is among the most important psychiatric disorders associated with diabetes. The relationship between diabetes and depression appears to be complex and potentially bidirectional. Depression may increase the subsequent risk of T2DM through behavioral mechanisms such as physical inactivity, unhealthy dietary patterns, obesity, poor sleep, and treatment-related factors, as well as biological mechanisms involving activation of the hypothalamic-pituitary-adrenal axis and inflammatory pathways. Conversely, the psychological burden of living with diabetes, chronic hyperglycemia, functional impairment, treatment complexity, and development of diabetic complications may increase vulnerability to depression.[2]

The magnitude of this comorbidity is considerable. An early meta-analysis by Anderson et al. demonstrated that depression was substantially more frequent among adults with diabetes than among individuals without diabetes.[3] A much larger updated systematic review and meta-analysis involving 248 studies reported an overall prevalence of depression of approximately 28% among people with T2DM. The prevalence was higher among women than men and showed substantial geographic variation.[4] These findings indicate that a considerable proportion of patients encountered in routine diabetes clinics may have clinically relevant depressive symptoms.

The coexistence of depression and diabetes has important clinical consequences. Depression may interfere with medication adherence, dietary modification, physical activity, glucose monitoring, and attendance at follow-up visits. Lustman et al. demonstrated a significant association between depression and hyperglycemia in patients with diabetes.[5] More recent evidence also suggests higher HbA1c levels among patients with T2DM and depression, although the magnitude and certainty of this association vary between populations.[6] Depression has additionally been associated with diabetic complications and adverse health outcomes.[7]

Several characteristics may increase vulnerability to depression among people with T2DM. Female sex, socioeconomic disadvantage, longer duration of diabetes, insulin therapy, poor glycemic control, multiple comorbidities, and microvascular or macrovascular complications have been reported as potential correlates.[4,8] However, prevalence and risk-factor profiles differ considerably across geographical, cultural, socioeconomic, and clinical settings.

Recognition of depression is particularly important because symptoms may remain undetected during routine diabetes consultations. The American Diabetes Association recommends screening people with diabetes for depressive symptoms at least annually, with more frequent assessment in those with a previous history of depression and reassessment when complications or significant changes in medical status occur.[1] Therefore, this study was undertaken to determine the prevalence of depression and evaluate associated risk factors among patients with T2DM attending a tertiary care teaching hospital.

Aim

To assess the prevalence of depression and associated risk factors among patients with type 2 diabetes mellitus.

MATERIALS AND METHODS

A hospital-based cross-sectional observational study was conducted among patients with T2DM attending the Department of General Medicine/Diabetology of a tertiary care teaching hospital. Both outpatient and eligible inpatient participants were considered for recruitment during the study period.

Study Population

Adult patients aged ≥18 years with an established diagnosis of T2DM who attended the study center during the specified study period were considered eligible.

Inclusion Criteria

Patients aged ≥18 years with established T2DM, receiving treatment for diabetes, and willing to provide informed consent were included.

Exclusion Criteria

Patients with type 1 diabetes mellitus, gestational diabetes, severe cognitive impairment, acute medical emergencies, inability to communicate adequately during assessment, or previously established severe psychiatric illness that prevented reliable questionnaire administration were excluded.

Sample Size

For this model manuscript, 200 participants were considered. For an actual study, the required sample size should be calculated using the anticipated prevalence of depression, desired absolute precision, confidence level, and allowance for nonresponse.

Data Collection

After obtaining informed consent, participants were interviewed using a structured case-record form. Sociodemographic variables included age, sex, residence, education, occupation, marital status, and socioeconomic characteristics. Clinical variables included duration of diabetes, treatment modality, presence of hypertension and other comorbidities, BMI, smoking and alcohol history, and presence of documented microvascular or macrovascular diabetic complications.

The most recent HbA1c value was recorded. For analytical purposes in this illustrative manuscript,

HbA1c ≥8.0% was categorized as poor glycemic control.

Assessment of Depression

Depressive symptoms were assessed using the Patient Health Questionnaire-9 (PHQ-9), a nine-item instrument based on symptoms of depressive disorders. Each item is scored from 0 to 3, producing a total score ranging from 0 to 27.[9] Depression severity was classified as minimal (0–4), mild (5–9), moderate (10–14), moderately severe (15–19), and severe (20–27). A PHQ-9 score ≥10 was considered clinically significant depressive symptomatology for the primary prevalence analysis.

A positive PHQ-9 screen should not by itself be considered equivalent to a definitive psychiatric diagnosis. Patients screening positive require appropriate clinical assessment, particularly when suicidal ideation is reported.

Ethical Considerations

The study protocol was to be approved by the Institutional Ethics Committee before commencement. Written informed consent was obtained from all participants. Confidentiality of patient information was maintained throughout the study. Patients identified as having clinically significant depressive symptoms were referred for further psychiatric/behavioral health assessment as appropriate.

Statistical Analysis

Data were entered into a spreadsheet and analyzed using appropriate statistical software. Continuous variables were expressed as mean ± standard deviation or median with interquartile range, while categorical variables were presented as frequencies and percentages. The chi-square test or Fisher's exact test was used to compare categorical variables. Independent-samples *t* test or an appropriate non-parametric test was used for continuous variables. Variables showing clinically or statistically meaningful associations were entered into multivariable logistic regression. Adjusted odds ratios (AORs) with 95% confidence intervals (CIs) were calculated. A two-sided *p* value <0.05 was considered statistically significant.

RESULTS

A total of 200 patients with T2DM were included. Their mean age was 55.4 ± 10.8 years. There were 108 (54.0%) males and 92 (46.0%) females. Ninety-six patients (48.0%) had diabetes for ≥10 years, while 82 (41.0%) had HbA1c ≥8%. At least one documented diabetic complication was present in 75 (37.5%) patients.

Table 1. Sociodemographic and Clinical Characteristics of Study Participants (n=200)

Variable	Category	Number (n)	Percentage (%)
Age	<50 years	62	31.0
	50–59 years	72	36.0
	≥60 years	66	33.0
Sex	Male	108	54.0
	Female	92	46.0
Duration of diabetes	<5 years	48	24.0
	5–9 years	56	28.0
	≥10 years	96	48.0
HbA1c	<8%	118	59.0
	≥8%	82	41.0
Treatment	Oral antidiabetic drugs	112	56.0
	Insulin ± oral drugs	60	30.0
	Other/combination therapy	28	14.0
Hypertension	Present	116	58.0
	Absent	84	42.0
Diabetic complications	Present	75	37.5
	Absent	125	62.5

Nearly half of the participants had lived with diabetes for ≥10 years. Poor glycemic control was present in 41.0%, while more than one-third had at least one diabetes-related complication.

Table 2. Distribution of Participants According to PHQ-9 Depression Severity

PHQ-9 Category	Score	Number (n)	Percentage (%)
Minimal	0–4	65	32.5
Mild	5–9	73	36.5
Moderate	10–14	34	17.0
Moderately severe	15–19	20	10.0
Severe	20–27	8	4.0
Clinically significant depression	**≥10**	**62**	**31.0**

The prevalence of clinically significant depressive symptoms was **31.0% (62/200)**. Moderate depression was observed in 17.0%, moderately severe depression in 10.0%, and severe depression in 4.0%.

Table 3. Factors Associated with Depression Among Patients with T2DM

Variable	Depression n/N (%)	No Depression n/N (%)	*p* value
Male	26/108 (24.1)	82/108 (75.9)	0.019
Female	36/92 (39.1)	56/92 (60.9)	
Diabetes <10 years	20/104 (19.2)	84/104 (80.8)	<0.001
Diabetes ≥10 years	42/96 (43.8)	54/96 (56.2)	
HbA1c <8%	27/118 (22.9)	91/118 (77.1)	0.003
HbA1c ≥8%	35/82 (42.7)	47/82 (57.3)	
Insulin-containing treatment	26/60 (43.3)	34/60 (56.7)	0.014
No insulin	36/140 (25.7)	104/140 (74.3)	
Diabetic complication present	34/75 (45.3)	41/75 (54.7)	<0.001
No documented complication	28/125 (22.4)	97/125 (77.6)	

Depression was significantly more frequent among females, patients with diabetes for ≥10 years, those with HbA1c ≥8%, patients receiving insulin-containing regimens, and those with diabetic complications.

Table 4. Multivariable Logistic Regression Analysis of Factors Associated with Depression

Predictor	Adjusted Odds Ratio (AOR)	95% CI	*p* value
Female sex	1.82	1.01–3.29	0.046
Diabetes duration ≥10 years	2.36	1.23–4.54	0.010
HbA1c ≥8%	2.08	1.10–3.95	0.024
Insulin-containing therapy	1.47	0.73–2.96	0.281
Presence of diabetic complications	2.31	1.20–4.46	0.012

After adjustment for potential confounders, female sex, diabetes duration ≥10 years, poor glycemic control, and diabetic complications remained significantly associated with depression. The association with insulin therapy was attenuated after multivariable adjustment.

DISCUSSION

The present study evaluated the prevalence of depressive symptoms and associated risk factors among patients with T2DM. In the illustrative dataset, 31.0% of participants had clinically significant depressive symptoms based on a PHQ-9 score ≥10. This finding highlights the considerable psychological burden that may accompany chronic diabetes.

The observed prevalence is broadly compatible with published literature. Farooqi et al., in an updated systematic review and meta-analysis encompassing 248 observational studies and more than 83 million participants, estimated an overall depression prevalence of approximately 28% among patients with T2DM.[4] Considerable heterogeneity was observed between regions, with prevalence estimates reaching approximately 32% in Asian populations. Earlier work by Anderson et al. similarly demonstrated that clinically relevant depression occurs substantially more frequently among individuals with diabetes than among people without diabetes.[3] Differences in prevalence between studies may reflect variation in population characteristics, cultural context, study setting, depression screening instruments, diagnostic thresholds, and severity of diabetes.

Female participants in the present model analysis demonstrated a significantly higher prevalence of depression than males. Female sex has repeatedly been identified as an important correlate of depression in diabetic populations. The large meta-analysis by Farooqi et al. reported depression in approximately 34% of females compared with 23% of males with T2DM.[4] Biological factors, social roles, caregiving responsibilities, socioeconomic disadvantage, and differential psychological responses to chronic disease may contribute to this association.

Longer duration of diabetes was another independent predictor of depression. Patients with diabetes for ≥10 years had more than twice the adjusted odds of depression compared with those having shorter disease duration. Prolonged exposure to the demands of diabetes self-management, progressive treatment intensification, accumulated comorbidities, and development of complications may contribute to psychological distress over time.

Poor glycemic control was significantly associated with depression. Patients with HbA1c ≥8% had approximately twice the adjusted odds of depression. Lustman et al. demonstrated a significant association between depression and hyperglycemia in a meta-analysis of patients with diabetes.[5] A recent systematic review and meta-analysis by Narra et al. also found that patients with T2DM and depression had, on average, higher HbA1c levels than their nondepressed counterparts, although heterogeneity was

considerable.[6] The relationship is likely bidirectional. Depression may reduce motivation for medication adherence, physical activity, healthy eating, and glucose monitoring, while persistent hyperglycemia and difficulties achieving therapeutic targets may worsen psychological distress.

Diabetic complications were also independently associated with depressive symptoms. This agrees with the meta-analysis by de Groot et al., which demonstrated an association between depression and diabetes complications.[7] Neuropathy, nephropathy, retinopathy, cardiovascular disease, pain, functional limitations, and fear of disability can substantially affect quality of life. A large Spanish study also identified neuropathy and other clinical characteristics as correlates of depression among patients with T2DM.[8]

Insulin treatment showed a significant association in unadjusted analysis but did not remain independently significant after adjustment. This may indicate that insulin therapy acts partly as a marker of longer disease duration or greater disease severity rather than being an independent determinant of depression.

The clinical implications of these findings are important. Depression may easily remain unrecognized when diabetes consultations focus primarily on glycemic indices and physical complications. Current American Diabetes Association recommendations support at least annual screening for depressive symptoms in people with diabetes and more frequent screening in those with a history of depression, with reassessment when complications or major changes in medical status occur.[1] Positive screening results should be followed by comprehensive clinical assessment and appropriate referral rather than being interpreted as a definitive psychiatric diagnosis.

CONCLUSION

Depression represents an important comorbidity among patients with T2DM. In the illustrative analysis, nearly one-third of patients had clinically significant depressive symptoms. Female sex, longer duration of diabetes, poor glycemic control, and presence of diabetic complications were independently associated with depression.

Routine screening for depression should therefore be considered an integral component of comprehensive diabetes care. Patients who screen positive should undergo appropriate clinical evaluation and, where indicated, receive psychological or psychiatric intervention alongside conventional diabetes management. Integrated care addressing both metabolic and psychological health may improve self-management, quality of life, and overall clinical outcomes.

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