

Presence of Co-morbid Depression among Diabetics of Less than 5 Years Duration in a Tertiary Care Institution, Chennai, Tamil Nadu, India: A Cross-sectional Study

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ABSTRACT

Introduction: Depression is a significant co-morbid condition for diabetics. Co-morbid depression results in worsened diabetes complications, deleterious effects on self-care activities, non adherence, and poor treatment outcomes.

Aim: To assess the prevalence of depression among type 2 diabetic patients attending a tertiary hospital and to find its association with socio-demographic and lifestyle factors.

Materials and Methods: A hospital-based cross-sectional study was done in the diabetic clinic of Government Stanley Medical College and Hospital, Chennai, Tamil Nadu, India between June 2016 and August 2016, involving 500 patients with Type II Diabetes Mellitus (T2DM) of less than five years' duration. The prevalence of depression was calculated using Beck's Depression Inventory Scale for a period of three months. The results were expressed in proportions, and the association of factors was tested using the Chi-square test and multivariable logistic regression analysis. A p-value <0.05 was considered statistically significant.

Results: The study included 500 participants, of whom the majority (276, 55%) were female, with a mean age of 46.2 years. The prevalence of depression was 55 (11%). It was found that

being female, illiterate, and unemployed were significantly associated with depression. Among disease-related factors, diabetes duration of 3-5 years, insulin injection usage, and the presence of diabetic complications were significantly associated with depression. Regarding lifestyle factors, the prevalence of depression was significantly higher among those who were non adherent to dietary modification practices and those with family worries and work-related tension. Multivariable logistic regression analysis revealed that the independent predictors of depression among diabetics were the presence of diabetic complications {Odds Ratio (OR)-2.48 (1.27-4.84)}, family worries {OR-2.54 (1.34-4.80)}, non adherence to follow-up {OR-2.61 (1.37-4.99)}, and non compliance with dietary modifications {OR-2.93 (1.43-5.99)}.

Conclusion: The present study revealed that about one in 10 (11%) diabetics with less than five years' duration have associated depression, with significant independent predictors being non compliant behaviours, the presence of complications, and family issues. Hence, diabetics should be screened simultaneously for depression, giving due attention to those with complications, family issues, and non compliant behaviours.

Keywords: Co-morbidity, Follow-up, Macrovascular complications, Type 2 diabetes

INTRODUCTION

Diabetes Mellitus (DM) is a widely prevalent yet alarming health problem with serious medical and economic consequences for individuals, families, and societies worldwide. Nearly half a billion people are subsisting with diabetes globally [1]. India is deemed to be an epicenter of the global diabetes pandemic, with an estimated 8.7% diabetic population in the age group of 20 to 70 years [2]. The magnitude of this disease burden is expected to continue increasing at alarming proportions in the future.

During the past 30 years, a mounting body of research has unfolded that depression is a significant co-morbid condition for individuals with diabetes. Patients with diabetes are found to be twice as likely to experience depressive symptoms as their peers without diabetes, supporting the existence of a bidirectional relationship between depression and DM [3].

Depression is a state of low mood that causes aversion to activities and has an impact on a person's thoughts, behaviour, feelings, and sense of well-being. Depression disrupts emotions, cognition, and behaviours. Depression can be described as a first episode, recurrent, or chronic episode; it can be mild, moderate, or severe, with or without psychotic features. The American Psychiatric Association's Diagnostic and Statistical Manual of Mental Disorders (DSM-5) states that diabetes itself is a mood disorder that manifests

several symptoms and impairs an individual's functionality [4]. Depression is the second leading cause of disability worldwide. It is estimated that 15%-20% of people with diabetes struggle with depression, more likely in a moderate to severe form [5].

A higher prevalence of depression in individuals with diabetes has been observed in many countries worldwide [6,7]. There is mounting evidence of a high prevalence of depression in the subgroup of patients with diabetes, with common associated factors being gender, income, socioeconomic status, co-morbid conditions, and complications as documented in the literature globally. A systematic review examining the relationship between depression and type 2 diabetes highlighted that depression is associated with a 60% increase in the risk of developing type 2 diabetes [6].

The Chennai Urban Rural Epidemiology Study (CURES) conducted by the Madras Diabetes Research Foundation (MDRF) in India reported that depression was prevalent among 23% of patients with type 2 diabetes and significantly increased among those with diabetic complications [7].

Compared to patients with diabetes alone, patients with both co-morbid depression and diabetes have shown poor compliance with lifestyle modification behaviours like dietary restrictions, physical activities, and self-care practices, as well as poor medication adherence [6]. This poor metabolic and glycemic control, in

turn, intensifies symptoms of depression [8]. Depression is both a consequence of diabetes as well as a risk factor for diabetes. Furthermore, co-morbid depression among diabetics was found to increase the risk of early mortality 2.3 times compared to non depressed patients with diabetes [9].

The Centres for Disease Control and Prevention (CDC) have reported that only 25 to 50% of people with co-morbid diabetes and depression are diagnosed and treated. In the absence of treatment, depression often worsens rather than improves, as noted by the CDC [10]. This further reaffirms that early recognition and treatment of depression to enhance medical outcomes in diabetes and optimise healthcare expenditures.

A situational analysis of the extent of depression and associated factors in patients with diabetes in respective settings could immensely contribute to improved and effective management of this dual burden. This could greatly assist policymakers in identifying at-risk groups for depression among diabetics and planning successful preventive programs. Furthermore, since literature has revealed a clear association between the duration of diabetes and depressive symptoms [6-11] and there is paucity of studies focusing on depression exclusively among diabetics with a short duration, this study is restricted to type 2 diabetics with a short duration to facilitate early tracking of depression.

Hence, the current study aimed to assess the prevalence of depression among type 2 diabetic patients with a duration of five years and the objective of the study is to find its association with sociodemographic and lifestyle factors.

MATERIALS AND METHODS

A hospital based cross-sectional study was conducted between June 2016 and August 2016 among patients attending the Diabetology clinic at Stanley Medical College, a government tertiary care hospital in North Chennai, Tamil Nadu, India. Ethical clearance was sought from the Institutional Ethics Committee. Confidentiality and privacy were ensured for the patients throughout the data collection (Dt.14062016 /IEC/SMC).

Inclusion criteria: Patients between the ages of 30 and 70 years with physician-diagnosed diabetes of less than five years' duration who consented to participate were included as study participants. This age group was taken for the study as type 2 diabetes is more common in this age group [12].

Exclusion criteria: The exclusion criteria included individuals with psychiatric problems before the diagnosis of diabetes, which was elucidated based-on previous treatment records and a history of antipsychotic drug use. Seriously ill patients, those with type 1 diabetes, pregnant women, and lactating mothers were also excluded.

Sample size: Using the formula for calculating sample size for cross-sectional studies, a sample size of 442 was arrived using a prevalence of 23% from an earlier study done by MDRF in Chennai [7]. Adding a non response rate of 10%, the sample size was rounded up to 500 diabetic patients.

A consecutive sampling method was adopted. Data was collected from the first 10 consecutive eligible patients coming to the diabetology Outpatient Department on successive working days until the sample size was reached.

Study Procedure

A structured questionnaire was formed and administered by the investigator, consisting of sociodemographic details, lifestyle factors, diabetic status, and depression assessment. The questionnaire was translated into the local language (Tamil) and back-translated into English to ensure accuracy. The Beck Depression Inventory 2nd edition (BDI-II), a pretested questionnaire, was used to assess the presence of depression [13].

The BDI-II timeframe extends for two-week period to align with the DSM-V criteria for major depressive disorder. This is a 21-item survey scored on a scale of 0 to 3 in increasing severity regarding each symptom of depression. It includes two sub-scores covering affective and somatic domains. The questionnaire was verbally administered to the patients in the same order as listed, and adequate time was provided for responses without prompting. Patients with BDI-II scores indicating mild depression or above were referred to the psychiatry clinic for counseling and further management.

Operational definitions of study outcome variables: In present study, "depression" refers to depressive symptoms identified in the BDI-II. Participants were asked to choose one of the four phrases listed in the BDI-II inventory that best described their state in the past two weeks, including the day of the questionnaire interview. Beck AT et al., suggested the following BDI-II cut-off scores for depression: 0-13 (minimal), 14-19 (mild), 20-28 (moderate), and 29-63 (severe) [13].

Education and occupation status were graded based on the Modified Kuppaswamy Scale [14]. Socioeconomic status was classified according to the BG Prasad scale 2016 [15]. For finding the association between socioeconomic status and depression, socioeconomic status was taken as upper (upper and upper-middle) and lower class (middle, lower-middle, and lower class).

STATISTICAL ANALYSIS

The data was checked for completion, coded, and entered into a computer using Microsoft Excel. It was analysed using IBM Statistical Packages for Social Sciences (SPSS) Statistics version 23.0 A p-value of <0.05 was taken to be statistically significant. Chi-square (χ^2) tests were used to compare the factors associated with depression scores of 14 on the BDI-II. Parameters with a p-value less than 0.05 were considered for multivariate analysis using the multiple logistic regression method to identify factors independently associated with depression among individuals with type 2 DM.

RESULTS

The study included 500 participants, the majority (55%) of whom were females. The mean age of the participants was 46.2 years. Most participants (96.2%) were married, and about one-fifth (19.6%) were illiterate. A family history of mental illness was reported by 15 participants. The sociodemographic characteristics of the study population are presented in [Table/Fig-1].

Parameters		Frequency	Percentage
Age (in years)	Less than 40 years	123	24.6
	40-59 y	339	67.8
	60 y and above	38	7.6
	Total	500	100
Gender	Male	224	44.8
	Female	276	55.2
	Total	500	100
Marital status	Married	481	96.2
	Unmarried	11	2.2
	Divorced	8	1.6
	Total	500	100
Education	Professionals	5	1.0
	Graduate	62	12.4
	Post high school/diploma	59	11.8
	High school	63	12.6
	Middle school	126	25.2
	Primary school	87	17.4
	Illiterate	98	19.6
	Total	500	100

Occupation	Professional	12	2.4
	Semi-professional	46	9.2
	Shop owner farmer, clerical	59	11.8
	Skilled	60	12.0
	Semiskilled	108	21.6
	Unskilled	70	14.0
	Unemployed	145	29.0
	Total	500	100
Socio economic status (BG Prasad 2016)	I (Upper class)	4	0.8
	II (Upper middle class)	152	30.4
	III (Middle class)	157	31.4
	IV (Lower middle class)	173	34.6
	V (Lower class)	14	2.8
	Total	500	100
Mental illness in the family	Yes	15	3.0
	No	485	97.0
	Total	500	100

[Table/Fig-1]: Baseline characters of the study population (N=500).

The prevalence of depression was 11% (55 individuals) based on Beck's depression inventory, taking 14 and above for at least mild depression among the participants. The distribution of minimal, mild, moderate, and severe depression according to the BDI-II scale is shown in [Table/Fig-2]. The mean total depression score was 8.42 (SEM=0.209). The average scores for the affective and somatic domains were 4.05±0.146 and 4.398±0.098, respectively.

Parameters	Frequency	Percentage
Minimal	445	89
Mild	41	8.2
Moderate	12	2.4
Severe	2	0.4
Total	500	100

[Table/Fig-2]: Prevalence of depression among study population.

Around two-thirds (60.4%) of the participants had diabetes for a duration of three years or less. One-fifth (20.8%) were current smokers, 13.8% were on insulin therapy, and 17.4% had a history of complications as per their diabetic records. Only 22.6% were compliant with follow-up visits. About 10% reported work tension, and one-fourth self-reported family worries. Self-reported compliance with antidiabetic medications and dietary modifications was high in present study. The results are presented in [Table/Fig-3].

Parameters	Frequency	Percentage (%)	
Duration of diabetes	Less than 3 y	302	60.4
	3 to 5 y	198	39.6
	Total	500	100
Compliance to treatment*	Yes	454	90.80
	No	46	9.20
	Total	500	100
Complications due to diabetes	Yes	87	17.40
	No	413	82.60
	Total	500	100
Insulin injection	Yes	69	13.80
	No	431	86.20
	Total	500	100
Follow-up visits (last 3 months)	Yes	113	22.6
	No	387	77.4
	Total	500	100

Current smoker	Yes	104	20.8
	No	396	79.2
	Total	500	100
Family worries*	Yes	138	27.6
	No	362	72.4
	Total	500	100
Work tension*	Yes	50	10.0
	No	450	90.0
	Total	500	100
Compliance to dietary modifications*	Yes	427	85.57
	No	72	14.43
	Total	500	100

[Table/Fig-3]: Diabetic status and lifestyle factors among study subjects.

*Self-reported

Univariate analysis of the association between the presence of depression and baseline variables revealed that being female, illiterate, and unemployed were significantly associated with depression ($p < 0.05$). Among disease-related factors, diabetes duration of 3 to 5 years, insulin therapy, and the presence of diabetic complications were significantly associated with depression ($p < 0.05$). Regarding lifestyle factors, depression was significantly higher among those who did not adhere to dietary modification practices and those experiencing family worries and work-related tension. The results were tabulated in [Table/Fig-4].

Parameters		Depression		Chi-square	p-value
		No	Yes		
Gender	Male	207 (92.4%)	17 (7.6%)	4.8219	0.028*
	Female	238 (86.2%)	38 (13.8%)		
Age	Less than 60 y	411 (89%)	51 (11%)	0.009	0.923
	60 y and above	34 (89.5%)	4 (10.5%)		
Education	illiterate	80 (81.6%)	18 (18.4%)	6.758	0.018*
	Literate	365 (90.8%)	38 (8.9%)		
Occupation	Employed	326 (91.8%)	29 (8.2%)	10.021	0.003*
	Unemployed	119 (82.1%)	26 (17.9%)		
Mental illness in family	Yes	13 (86.7%)	2 (13.3%)	0.086	0.769
	No	432 (89.1%)	53 (10.9%)		
Duration of diabetes	<3 years	277 (91.7%)	25 (8.3%)	5.771	0.016*
	3 to 5 y	168 (84.8%)	30 (15.2%)		
Socioeconomic status	Upper (upper and upper middle)	146 (93.36)	10 (6.4%)	4.771	0.041*
	Lower (middle, lower middle and lower)	301 (87.5%)	43 (12.5%)		
On insulin	Yes	56 (81.2%)	13 (18.8%)	5.026	0.025*
	No	389 (90.3%)	42 (9.7%)		
Diabetic complications	Yes	66 (75.9%)	21 (24.1%)	18.57	0.0001*
	No	379 (91.8%)	34 (8.2%)		

Dietary modification practices	Yes	389 (91.1%)	38 (8.9%)	13.59	0.001*
	No	55 (76.4%)	17 (23.6%)		
Family worries	Yes	112 (81.2%)	26 (18.8%)	11.969	0.001*
	No	333 (92%)	29 (8%)		
Work tension	Yes	40 (80%)	10 (20%)	4.594	0.032*
	No	405 (90.0%)	45 (10%)		
Current smoker	Yes	95 (91.3%)	9 (8.7%)	0.738	0.48
	No	350 (88.4%)	46 (11.6%)		
Follow-up	Yes	90	23	13.048	0.001*
	No	355	32		

[Table/Fig-4]: Factors associated with depression among diabetics in the study sample (N=500).

*For statistical purposes the upper and upper middle categories were combined as upper and middle, lower middle and lower categories were combined as lower

*p<0.05

Multivariate logistic regression analysis identified that independent predictors of depression among diabetics were the presence of diabetic complications, family worries, non-adherence to follow-up, and non-compliance with dietary modifications. The results are presented in [Table/Fig-5].

Parameters		Adjusted odds ratio (95% CI)	p-value
Gender	Male	1	0.53
	Female	1.25 (0.62-2.52)	
Education	Literate	1	0.50
	illiterate	1.28 (0.62-2.66)	
Occupation	Employed	1	0.10
	Unemployed	1.90 (0.88-4.10)	
Socioeconomic status	Upper	1	0.95
	Lower	1.02 (0.47-2.24)	
Duration of diabetes	<3 y	1	0.28
	3 to 5 y	1.40 (0.75-2.63)	
On insulin	No	1	0.74
	Yes	1.14 (0.53-2.46)	
Diabetic complications	No	1	0.008*
	Yes	2.48 (1.27-4.84)	
Dietary modification practices	Yes	1	0.003*
	No	2.93 (1.43-5.99)	
Follow-up	No	1	0.004*
	Yes	2.61 (1.37-4.99)	
Family worries	No	1	0.004*
	Yes	2.54 (1.34-4.80)	
Work tension	No	1	0.074
	Yes	2.19 (0.93-5.14)	

[Table/Fig-5]: Multivariate logistic regression analysis of factors associated with depression among diabetic study subjects (N=500).

*For statistical purposes the upper and upper middle categories were combined as upper and middle, lower middle and lower categories were combined as lower

DISCUSSION

There was a substantial variation in the prevalence of depression among people with type 2 diabetes across the globe. A systematic review done in India, which included 41 selected studies, documented the prevalence of at least mild depression among individuals with diabetes in the range of 8%-84% [6]. The current study reported a prevalence of 11%, which falls within the lower

range documented in the above meta-analyses done in India [16]. An earlier World Health Survey done in 60 different countries over a one-year period reported a depression prevalence of 2% in adults aged 18 years and above [17]. A large population-based study on depression among type 2 diabetic individuals in the United States estimated an overall prevalence of depression to be 10.6%, which is congruent to the findings of the present study [18].

However, the present study documented a lower prevalence of depression compared to a recent meta-analysis by Hussain S et al., in India and systematic reviews done in Southeast Asia, which revealed pooled prevalences of 38% and 27.7%, respectively, for depression among type 2 diabetic patients [16,19]. Other studies across the world viz., Palestinian study (40%), Ethiopia (47%), and Mexico (48.27%), indicated a higher prevalence of depression among diabetics [20-22].

The current study focused only on individuals with diabetes of five years duration, with the majority having diabetes for less than three years, which could contribute to the lower prevalence observed. In contrast, the aforementioned hospital-based studies had a significant proportion of diabetics with more than 10 years duration. Substantial evidence has also supported the findings that the duration of diabetes influences depressive symptoms, contributing to a “J-shaped” curve over time in type 2 diabetics [11]. Trajectories of diabetes duration and depression revealed that depressive symptoms elevate immediately following the diagnosis of diabetes, then diminish over several years before increasing again with longer duration. This could be the reason for lower prevalence observed in the present study, which exclusively included diabetics within five years of diagnosis alone.

Wide variations in the reported prevalence of depression in diabetic patients across different studies may be explained by heterogeneity in measurement scales and cut-offs used, geographical variations, and variations in the characteristics of the study population. A wide variety of questionnaires are available to measure depressive symptoms. Regarding the scale used in the current study, the BDI-II showed high reliability and good correlation with measures of depression and anxiety [23].

The biological plausibility of the association between diabetes and depression has been established by Mendelian randomisation studies, which provided genetic evidence for a reciprocal causal association between them [24].

The present study showed that female diabetics had a significantly higher propensity for depression, which was endorsed in earlier studies [7,17]. Patients receiving insulin injections in the current study showed a significantly higher association with depression, a finding that has also been reported in other studies [25,26]. This underscores the need for periodic screening for depression among patients receiving intensified treatment with insulin.

Moreover, the present study found that depressed patients had poor adherence to dietary modification practices, consistent with a study conducted in Jordan [27]. Low literacy rates, being unemployed, and the burden of being from a lower socioeconomic status were associated with depression in the current study, which is in congruent with some studies in the literature [27,28].

Also, diabetic patients suffering from complications of diabetes were found to be more liable to depression. The present finding was consistent with other studies [29,30], which showed that both macrovascular and microvascular complications have been associated with an increase in symptoms of depression.

The current study also showed that depressed diabetic patients have recorded significantly decreased compliance with follow-up. Results from 47 independent samples indicated that depression was significantly associated with worse self-care, with the effect being strongest and homogeneous for studies on missed medical appointments. This could be explained by the fact that adherence

to continuity of care is closely related to interpersonal behaviour, and clinically, depression is associated with impairments in interpersonal behaviour such as social withdrawal, disengagement, or disruption of important activities and avoidance behaviours [31,32].

Diabetics should be screened simultaneously for depression, and concomitant preventive strategies should be used to improve outcomes. Exploring this association at the initial stage of type 2 diabetes would assist clinicians and psychiatrists in enhancing the efficacy of treatment and instituting effective tertiary prevention measures.

Hence, the present study advocates for the integration of behavioural healthcare into the chronic care management of patients with diabetes as a promising strategy to enhance adherence to follow-up and thereby prevent morbidity and mortality among diabetics. This approach could be incorporated into existing health services at primary, secondary, and tertiary levels of healthcare by task-shifting to non-specialist health workers to deliver front-line care and a supervisory framework of appropriately skilled mental health workers, as demonstrated by the chronic care model developed by Katon W et al., called TEAMcare [33].

As a result, a sustainable continuity of care for diabetics could be achieved by incorporating screening for depression into chronic disease clinics.

Limitation(s)

The current study, being cross-sectional, could not find the causal effect of diabetes on depression and vice versa. Furthermore, lifestyle factors such as dietary modifications, follow-up, and the presence of family issues were self-reported, as using individual study instruments for each determinant would be beyond the scope of the current study. A longitudinal study could be planned to track the trajectory of comorbid depression through the course of diabetes and its influencing factors. Moreover, an interventional study to address depression among diabetics and then measure their compliance and other outcomes could be contemplated in the future to influence policy decisions.

CONCLUSION(S)

The present study revealed that about 11% of diabetics with less than five years of duration have associated depression and non compliant behaviours. The presence of complications and family issues were significant independent predictors for this association. Hence, diabetics should be screened simultaneously for depression, giving due attention to above groups. This would, in turn, prove to be a promising strategy to enhance adherence to follow-up and thereby prevent morbidity and mortality among diabetics. Implementing concomitant preventive strategies could help improve long-term outcomes.

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