

Prevalence and predictors of depression and anxiety in patients of diabetes mellitus in a tertiary care center

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ABSTRACT

Background: Diabetes is one of the most common chronic diseases and affects virtually every organ of the human system. Depression and anxiety is common among patients with diabetes and associated with worse diabetes outcomes. **Aims and Objective:** To study the prevalence and predictors of depression and anxiety in patients of Type 2 diabetes mellitus (T2DM) in Pt. B.D. Sharma, PGIMS, Rohtak, Haryana, India, a tertiary care center in Northern India. **Materials and Methods:** Four hundred ten consecutive patients having T2DM and 410 healthy controls matched for age and sex attending the endocrine out-patient department of a tertiary care center of Northern India were included in the study. Sociodemographic and relevant clinical variables were collected. They were evaluated for depression and anxiety using Hamilton Depression Rating Scale and Hamilton Anxiety Rating Scale respectively. **Results:** It was found that a significantly larger proportion of diabetic patients had depression (26.3% vs. 11.2%, $P = 0.001$), anxiety (27.6% vs. 12.7%, $P = 0.001$) and comorbid depression and anxiety (21.0% vs. 7.3%, $P = 0.001$) as compared to healthy controls. Diabetic women had higher depression (17.1% vs. 9.3%) and anxiety (17.6% vs. 10.0%) than men. The major predictors for a severe form of depression and anxiety among T2DM cases were age, female sex, insulin therapy, retinopathy, nephropathy, and ischemic heart disease. **Conclusion:** The present findings reveal that diabetic cases had significantly higher depression and anxiety as compared to healthy controls. The risk factors for depression and anxiety were age, female sex, insulin therapy, and diabetic complications.

Key words: Anxiety, depression, diabetes mellitus, predictors, prevalence

INTRODUCTION

Diabetes is one of the most common chronic conditions in the world. The worldwide prevalence of diabetes mellitus (DM) has risen dramatically over the past two decades because of increasing obesity and reduced activity levels. India has the largest number of diabetic population in the world, and it is expected that there will be 69.9 million diabetic populations

in India by 2025.^[1] Type 2 DM (T2DM) and major depressive disorder (MDD) are both chronic diseases that may progress for years before diagnosis. Studies have found that presence of diabetes increases the risk of developing depression.^[2,3] Also, the presence of depression enhances the chance of developing T2DM.^[4] Anxiety is frequently associated with depression and is also not uncommon among diabetic population.^[5,6] Comorbid depression, anxiety, and diabetes are associated with worse diabetes outcomes.^[7,8]

Worldwide estimates of the prevalence of depression and anxiety among diabetic patients appear to vary by nations;

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though data is scarce from developing countries, studies from Asia (including India) report prevalence rates of depression ranging from 17% to 44% and for anxiety it is from 4% to 58%.^[9-14] Due to varying prevalence rate of diabetes as well as depression and anxiety from various parts of India, the exact disease burden still remains unclear. The prevalence of comorbid diabetes, depression and anxiety is limited in Northern India. Therefore, the present study was carried out to find out the prevalence and risk factors of depression and anxiety, among patients of T2DM in a tertiary care center of Haryana.

MATERIALS AND METHODS

The study had a cross-sectional, case-control study design. It was carried out from June 2010 to March 2011 in Endocrine Department of Pt. B.D. Sharma PGIMS, Rohtak, Haryana, India. The study protocol was approved by the Ethics Committee of the Institute. After taking informed and written consent, a total of 820 participants were included in the study. Four hundred ten patients were having T2DM and 410 were healthy controls.

Inclusion criteria

- Patients above 18 years of age
- Patients of either sex
- Patients having T2DM irrespective of their duration of illness or diabetic treatment.

Exclusion criteria

- Patients with chronic medical or surgical illness other than DM
- Patients on long-term treatment for other medical illness
- Patients who were terminally ill
- Patients having renal, neurological, or cardiovascular dysfunction who require immediate hospitalization for serious illness and
- Patients who were on corticosteroids or any psychotropic drug.

Measures

- A semi-structured proforma was used to obtain sociodemographic variables of patients and relevant past medical and psychiatric history and duration of illness, treatment taken for diabetes. Anthropometric measurements including weight, waist circumference, body mass index (BMI), were recorded. Fasting and postprandial plasma glucose level glycosylated hemoglobin (HbA1c) levels were done. Furthermore, lipid profile, serum creatinine, spot urine for microalbuminuria, funduscopy was done to assess for any diabetes related complications

- Hamilton Depression Rating Scale was administered to assess the presence of depression as well as severity. The scale consists of 17 items. In this scale, the score ranges from 0 to 54 where 0–7 indicate a normal person with regard to depression, 8–13 indicate mild depression, 14–18 indicate moderate depression and ≥ 19 indicate severe depression^[15]
- Hamilton Anxiety Rating Scale was used to assess the presence of anxiety. Scale consists of 14 items with a total score range of 0–56, where 0–5 indicate no anxiety, 6–14 indicate mild anxiety, 15–28 indicate moderate anxiety and ≥ 29 indicate severe anxiety.^[16]

Statistical analysis

The data collected during the study was entered in the Microsoft Excel format and was analyzed using IBM SPSS Statistics software version 17. A descriptive statistical analysis was done for continuous and categorical variables. Differences in characteristics between participants were tested with unpaired *t*-test for normally distributed variables and with the Chi-square test for categorical variables. Binary logistic regression model was used to examine the association between predictor variables and risk of depression. Results were expressed as odds ratio (OR) and 95% confidence intervals. The *P* values were two-tailed, and probability level of significant difference was set at < 0.05 .

RESULTS

A total of 820 participants were enrolled in the study. Four hundred ten patients had T2DM and 410 participants were taken as healthy controls. Their sociodemographic and clinical characteristics are shown in Table 1. There were 213 females (52.0%) and 197 males (48.0%) in both groups, respectively. Most of the diabetic cases (63.4%) and healthy controls (61.7%) were in the 41–60 years age group.

The prevalence rate of depression, anxiety, and comorbid depression and anxiety among diabetic and healthy controls group are shown in Table 2. Table 3 shows independent risk factors for depression and anxiety respectively among the patients of DM calculated by applying logistic regression analysis. For depression OR was higher for retinopathy with the value of 5.24, followed by 4.48 for marital status and 3.57 for nephropathy and insulin therapy. For anxiety, OR was higher in retinopathy with the value of 4.95, followed by 4.41 for nephropathy and insulin therapy. The presence of complications as independent risk factors for depression and anxiety in patients of DM has been depicted in Table 4.

Table 1: Sociodemographic and clinical profile of the participants

Variables	Diabetic group (n=410)	Diabetic group (n=410)	P
Age (in years)	54.73±9.9	52±10.50	0.509
Sex			
Male	0.92	0.92	1.000
Female			
Marital status (%)			
Married	391 (95.4)	357 (87.0)	0.124
Unmarried	5 (1.2)	53 (13)	
Widow	14 (3.4)	0	
Type of family (%)			
Joint	234 (57.1)	96 (23.4)	0.062
Nuclear	176 (42.9)	314 (76.6)	
Residential area (%)			
Rural	31 (32)	112 (27.4)	0.518
Urban	279 (68)	298 (72.7)	
Education level (%)			
Illiterate	69 (16.8)	58 (14.1)	0.504
Literate	149 (83.2)	155 (85.9)	
Income (rupees/month)	14213.82±8988.82	16,605.63±11,924.33	0.071
Height (cm)	161.32±9.93	161.59±9.23	0.065
Weight (kg)	67.35±10.07	58.74±7.28	0.001*
BMI (kg/m ²)	25.96±3.79	22.44±1.37	0.001*
Waist (cm)	95.76±10.69	92.54±8.13	0.104
Fasting plasma sugar (mg/dl)	157.43±52.47	82.75±7.77	0.001*
Postprandial plasma sugar (mg/dl)	230.40±62.80	115.72±12.97	0.001*
Duration of diabetes (years)	6.78±5.52	-	-
HbA1c (%)	9.66±2.06	-	-

*P<0.05 Significant. BMI: Body mass index, HbA1c: Glycosylated hemoglobin

Table 2: Prevalence rate of depression, anxiety and comorbid depression and anxiety in diabetic and healthy control group

Prevalence rate	Diabetic group (n=410) (%)	Healthy control group (n=410) (%)	P
Depression	108 (26.3)	46 (11.2)	0.001*
Anxiety	113 (27.6)	52 (12.7)	0.001*
Comorbid depression and anxiety	86 (21.0)	30 (7.3)	0.001*

*P<0.05 significant

DISCUSSION

Prevalence and predictors of depression

The findings of the present study suggested that depression and anxiety were 2 times more prevalent patients with T2DM (26.3% vs. 11.2%) than in healthy controls. A rising trend in prevalence of depression and anxiety in diabetic patients has been suggested by the studies done in various parts of the world as well as in India. In a population-based study in Chennai, it was found that the prevalence of depression was 23.4%.^[11] Raval *et al.* found a very high prevalence (41%) of depression in 300 patients with type 2 diabetes in a tertiary care hospital in Northern India.^[12] Another study conducted at a tertiary care center found the prevalence of depression in T2DM patients to be 16.9%.^[13]

Table 3: Predictors of depression and anxiety among patients of diabetes mellitus (results of logistic regression analysis)

Independent variables	OR	95% CI for OR		P
		Lower	Upper	
Depression				
Sex	1.488	0.310	2.770	0.002*
Age (in years)	1.432	0.238	3.784	0.005*
Income (rupees/month)	1.701	0.083	2.681	0.021*
Marital status				
Married	4.481	0.739	27.23	0.048*
Type of family				
Joint	1.459	0.272	2.774	0.003*
Insulin therapy	3.572	2.251	5.663	0.001*
Retinopathy	5.241	2.421	13.509	0.001*
Nephropathy	3.573	2.251	5.663	0.001*
IHD	2.413	0.263	4.650	0.001*
Anxiety				
Sex	1.515	0.329	2.804	0.033*
Age (in years)	1.409	0.229	2.732	0.002*
Marital status				
Married	4.194	0.691	25.457	0.036*
Type of family				
Joint	1.481	0.288	2.805	0.005*
Insulin therapy	4.410	2.781	6.994	0.001*
Retinopathy	4.951	2.775	15.53	0.001*
Nephropathy	4.410	2.781	6.994	0.001*
IHD	1.288	0.183	2.453	0.001*

*P<0.05 Significant. OR: Odds ratio, CI: Confidence interval, IHD: Ischaemic heart disease

Table 4: Presence of complications as independent risk factors for depression and anxiety in patients of diabetes mellitus

Type of complication	Depression (%)	P	Anxiety (%)	P
Retinopathy	25.4	0.001*	21.7	0.001*
Nephropathy	13.9	0.001*	15.4	0.001*
Neuropathy	16.3	0.330	19.0	0.403
IHD	13.4	0.001*	15.1	0.001*
Hypertension	18.5	0.589	19.5	0.502

*P<0.05 significant. IHD: Ischaemic heart disease

A multi-center study done in Pakistan found prevalence as 43.5%.^[14] Various other studies found that prevalence of depression in T2DM ranging from 13.6% to 67.5%.^[17,18] However, studies from US and UK reported the prevalence of depression in patients with T2DM varying from 30% to 83%.^[19,20] Similarly, a meta-analysis identified the prevalence of depression in diabetes ranging from 8% to 61%.^[2] The varying rates of prevalence may be accounted for methodological differences such as self-reported depressive symptoms versus clinically diagnosed depression. In addition, the lack of documentation regarding relevant factors associated with the disease state (e.g. number of diabetes complications, other medical comorbidity) may confound results of clinical studies and skew prevalence rates.

The prevalence rate of depression was higher in age between 41 and 60 years (18.8% vs. 7.6%, respectively) in

diabetic and healthy control group. This may be because diabetic patients require adherence to a complex set of treatment regimens including daily multiple insulin injections, monitoring blood glucose level, adherence to specific dietary guidelines, and attending regular medical check-ups. Furthermore, a number of risk factors may increase the likelihood of depression including female gender, family dysfunction, and stressful experience in this age group. These results correlate with previous findings of higher prevalence rate of depression in age group of 31–59 years.^[21] Raval *et al.* also found a higher rate of depression in diabetic patients with age >54 years.^[12]

Diabetic women had higher prevalence of depression (17.1% vs. 9.3%) as compared to diabetic men. This could be attributable to gender-specific issues such as pregnancy, menstrual cycle changes, postpartum, and stresses such as responsibilities at work and home, caring for children and aging parents which could all lead to depression. Similar findings were found in previous literature.^[17]

The prevalence rate of depression was higher in low income group. This may be due to the high cost involved in the management of diabetes which adds to higher psychological stress. This finding is supported by Katon *et al.* in their study.^[22] Also, the prevalence rate was higher in married patients. This may be attributed to the greater responsibilities on them such as managing their career aspirations and family responsibilities together, upbringing their children and most importantly managing the chronic illness like diabetes which adds to their financial and emotional burden. This finding is in contrast with the previous study where it was found that the prevalence rate of depression is higher in single diabetic patients.^[22] They found that marriage integrates people into wider social networks, buffers life from strains and provide personal security, meaningfulness, and purpose. Depression was found to be significantly associated with joint family system in patients of diabetes. This may be attributable to the fact that in a joint family system, number of individuals is more as compared to earning hands which adds to financial burden, lack of freedom in decision making which adds to emotional burden, greater interference and loss of individuality making them more prone to psychological problems. This is in contrast with an earlier study which found that depression was more common in nuclear family as middle aged person in a single family might find no help from elders in the face of chronic or severe stress and develop depressive symptoms.^[23] In Western world, limited literature is available on association between joint family system and depression as nuclear families are more common in these countries.

Depression was found significantly associated with retinopathy 25.4% (0.001), nephropathy 13.9% (0.001) and ischemic heart disease (IHD) 13.4% (0.001) in the present study. This could be attributable to difficulty in adhering to diet, exercise and poor compliance with prescribed medications by diabetic patients, which would lead to development and progression of both microvascular and macrovascular complications. The results of the present study are similar to earlier studies which showed that the prevalence of depression was significantly higher among diabetic subjects with retinopathy, neuropathy, nephropathy and macrovascular complications (e.g. coronary artery disease, peripheral vascular disease [PVD], etc.).^[8] Poongothai *et al.* also observed that retinopathy, neuropathy, nephropathy, and PVD were associated with depression while Raval *et al.* found a significant association between depression and neuropathy, nephropathy, PVD and diabetic foot disease, but no significant association of depression with coronary artery disease was found in both studies.^[11,12] Insulin therapy was significantly associated with depression in the present study. This finding suggests that the diabetic patients on insulin therapy face more daily stresses (routine multiple injections, repeated investigations, and hospitalizations and fear of complications) as compared to diabetic patients on oral therapy. Previous literature also suggested that the severity of depressive symptoms was significantly higher (<0.001) in insulin dependent diabetic patients as compared to noninsulin dependents.^[24]

Prevalence and predictors of anxiety

The present study also found that the prevalence rate of anxiety was 27.6% which was almost similar to depression (26.3%) and it was twice as high as compared to healthy controls (27.6% vs. 12.7%). In contrast, the prevalence rate of anxiety was found to be high in few previous studies as 35.3–57.9% and a low prevalence of about 3.9% in other studies as compared to the present study.^[10,14,17] The differences in prevalence rate may be attributed to various scales used and methods that were applied in calculating the prevalence rate of anxiety.

In this study age, female sex, marital status, type of family, retinopathy, nephropathy, IHD, and insulin therapy were significant predictors of anxiety. Diabetic women were found to have significant higher anxiety scores (17.6 vs. 10.0%) as compared to diabetic men. Similar findings were found in a previous study which showed that anxiety scores in women and men were 70.1–61.6%, respectively.^[17] The prevalence rate of anxiety in diabetic patients was also found to be significantly high in age group of 41–60 years (20.5%). The microvascular (retinopathy and nephropathy) and macrovascular (IHD) complications were also significantly associated with anxiety. Khuwaja *et al.*

also showed a significant association between anxiety and macrovascular complications like hypertension and IHD.^[14] A few Indian studies observed anxiety to be significantly associated with BMI, physical activity, HbA1c level and postprandial blood glucose level, but no such associations were found in the present study.^[13]

Comorbid depression and anxiety with diabetes mellitus

The prevalence rate of comorbid depression and anxiety in diabetic patients was (21.0% vs. 7.3%, $P = 0.001$) as compared to healthy controls. Thomas *et al.* found a higher prevalence rate of comorbid depression and anxiety in diabetic patients (36.0%) as compared to the present study.^[25] In a study conducted in Southern India, it was found that clinical depression was present in 12.1%, generalized anxiety disorder (GAD) in 19.0% and as high as 87% patients of depression were also suffering from anxiety disorder.^[26] In the National Comorbidity Survey from US, 58% of MDD patients were found to have an anxiety disorder; among these patients, the rate of comorbidity with GAD was 17.2% and with panic disorder was 9.9%.^[23] Patients with diagnosed anxiety disorder also had high rates of comorbid depression, including 22.4% of patients with social phobia, 9.4% with agoraphobia and 2.3% with panic disorder.^[27] For most of the patients, the symptoms of both depression and anxiety were not severe enough (i.e. subsyndromal) to justify a primary diagnosis of either MDD or an anxiety disorder indicating the need for appropriate management to alleviate symptoms and prevent the emergence of more serious disease.^[28] Accumulating evidence indicates that patients with comorbid depression and anxiety tend to have greater illness severity and a lower treatment response than those with either disorder alone.^[29] There is limited data available which showed the determinants of comorbid depression and anxiety in patients of diabetes; however Thomas *et al.* found that the comorbid depression and anxiety was significantly associated with age (45.16 years) and high education level.^[25] In the present study, comorbid depression and anxiety was significantly associated with age (40–61 years), obesity (BMI ≥ 25 kg/m²), poor glycemic control, insulin therapy, nephropathy, neuropathy, and IHD but no significant association was found with education level.

Thus, it is suggested that depression and anxiety symptoms were two-fold higher in diabetic patients as compared to healthy controls, and major predictors of depression and anxiety among diabetic cases were increasing age, female sex, marital status (married), joint family system, insulin therapy, retinopathy, nephropathy, and IHD.

The present study findings have potential clinical implications but also have certain limitations. First, due to the cross-sectional study design, it is not possible to

draw long-term conclusions. Second, the study had a small sample size and carried out in a tertiary care center; the results cannot be generalized to general population setting. Third, there are certain confounding variables such as smoking, alcohol use, and duration of diabetes, present in the study group. Further, multi-center, longitudinal studies in different geographical areas need to be considered to establish causal relationship between depression and diabetes.

CONCLUSION

Our study showed a high prevalence of depression and anxiety in patients with T2DM. The presence of risk factors for depression among patients of diabetes predicts a causal relationship and deserves attention from clinicians. Therefore, screening for depression and anxiety among diabetic patients needs to be done at each clinical contact, particularly in older adults, female sex, and those on insulin therapies and with complications.

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Conflicts of interest

There are no conflicts of interest.

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