



## Original Article

# Depression in Patients with Diabetes Mellitus-an Analytical Study in Rajshahi

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### Abstract

**Background:** Depression is one of the most common comorbid psychiatric disorders associated with diabetes mellitus (DM), and it impacts glycemic control. Optimal management of depression may lead to better control of glucose levels in DM.

**Objectives:** The aim of this study was to assess depression in patients with DM and to compare it with healthy control and to determine the association of depression with glycemic control and socio-demographic profile in patients with DM and healthy control.

**Patients and methods:** This cross-sectional comparative study was conducted among 140 patients with DM attending Rajshahi Medical College Hospital and Diabetic Association Hospital, Rajshahi, from July 2014 to June 2016. Subsequently, 140 age-matched healthy controls were included in this study. The DSM-V criteria were used to diagnose depression and the severity of depression was assessed by the Hamilton rating scale for depression. Blood glucose control was assessed by measuring HbA1c and categorized as: good glycemic control <7%, fair glycaemic control 7-8% and > 8% considered as poor glycemic control.

**Results:** The proportion of depression was significantly higher in the patient (51, 36.4%) than in the control (20, 14.3%) ( $X^2= 18.256$ ,  $df= 2$ ,  $p < 0.001$ ). Among patients 13 (9.28%) had mild depression, 23 (16.42%) had moderate depression and 15 (10.70%) had severe depression. But among control 11 (7.87%) had mild depression, 7 (5%) had moderate depression and 2 (1.43%) had severe depression. Depression was more in patients aged 40-60 years (45, 42.1%) than in those aged 18-39 years (6, 18.2%) which was statistically significant ( $t = - 3.947$ ,  $p < 0.001$ ). Both mild, moderate and severe depression were more common among singles, obese, Type 2 DM & patients who were taking both insulin & OHA. Statistically significant depression were observed in poorly controlled DM (HbA1c>8%) compared to fair control (HbA1c 7-8%) ( $p < 0.001$ , 95% CI = 2.29 to 3.82) and good control (HbA1c < 7%) ( $p < 0.001$ , 95% CI = 4.25 to 5.98). The likelihood of depression was not significantly associated with different occupation, level of education, residence and duration of DM. Significant positive correlation was observed between DSM-V score and age ( $r = 0.295$ ,  $p < 0.001$ ), BMI ( $r = 0.473$ ,  $p < 0.001$ ), duration of DM and HbA1c ( $r = 0.734$ ,  $p < 0.001$ ) in patients with DM.

**Conclusion:** Our findings demonstrate that there is a higher proportion of depression in patients with DM, which is almost thrice than healthy control. Since patients with DM are at higher risk of developing depression, assessment of depression should be part of the initial and ongoing evaluation of these patients to improve their quality of life.

**Key words:** DM, Depression, OHA, DSM-V, HbA1c.

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## Introduction

Diabetes mellitus (DM) is a chronic, lifelong but treatable disease. Uncontrolled DM eventually presents with various complications involving many organs. Some of these complications are short-term, and others are long-term but preventable and treatable. Treatment of DM, like most chronic illness, involves the active participation of the patient himself /herself. The affected person comes under many constraints in life. Free lifestyle is hindered because of the disease. After diagnosis, the patient comes to know the nature and complication of the disease; and often has to follow a rigorous discipline regarding diet, medication, and everyday life.

This implored lifestyle causes a change in his attitudes and brings some question. These are: shall I be able to lead a free-style life like a normal person? Is my life expectancy shortened? etc. Besides these, during treatment many a time, blood glucose fluctuates, and it causes further frustration.

These conflicts and frustration often interplay and give rise to a various grades of melancholia in some diabetic patients. Many of them remain normal, but some of these patients suffer from depressive illness of varying severity.

Likewise, depression is a major health problem.<sup>1</sup> It has been found to be more disabling disease than many common chronic medical illness.<sup>2</sup> In fact, depression is expected to be the second leading cause of disability for all age groups by the year 2020.<sup>3</sup> Chronic medical problems increase the prevalence of depression.<sup>4</sup> Depression is twice more prevalent among persons with diabetes.<sup>5</sup> The lifetime prevalence of the major depressive disorder is up to 17% in the general population and is up to 27% in patients with diabetes.<sup>6</sup>

There is emerging literature regarding the efficacy and cost-effectiveness of treatments for depression.<sup>7</sup> The most recent comprehensive review of published randomized controlled trials of treatment of depression among individuals with diabetes concluded that treatments are effective.<sup>8</sup> Conclusions of the review indicated that

treatments for depression in patients with diabetes could include: antidepressants, psychotherapy, or combination therapies

## Materials and methods:

One hundred and forty diagnosed case of Diabetes mellitus were included in this study. The diagnosis of DM was based on WHO criteria (RBS / 2 hours after 75 gm glucose load  $\geq 11.1$  mmol/L or FBS  $\geq 7.0$  mmol/L). The DSM-V criteria were used to diagnose depression. The depressed patients were further assessed to see the severity of depression by using "The Hamilton Rating Scale for Depression". After that, patients were categorized into three groups: mild depression, moderate depression and severe depression. Blood glucose control was assessed by measuring HbA1c levels, a reliable method for estimating glycaemic control over the last 90-120 days. HbA1c level was categorized as: good glycaemic control  $<7\%$ , fair glycaemic control 7-8%, and  $> 8\%$  considered as poor glycaemic control.<sup>9</sup>

After satisfying the inclusion and exclusion criteria, patients with DM attending Rajshahi Medical College Hospital and Diabetic Association Hospital, Rajshahi was included in this study. 68 male and 72 female subjects were enrolled. Simultaneously age-matched 140 normotensive, nondiabetic healthy individuals were selected in this study. Among them, 69 were male, and 71 were female.

With the consent of the concerned authority, the data was collected from the respondents according to the questionnaire by face-to-face interview. A complete history was taken, and a thorough clinical examination was done with measurement of pulse, respiratory rate by standard method. Blood pressure was measured in sitting position after 5 minutes of rest. Measurement of height and weight was done for the calculation of BMI. The patients' blood samples were collected for measurement of fasting blood sugar, HbA1c, and postprandial blood sugar (2-hour after breakfast). All relevant clinical examination findings and laboratory results were recorded in a case record form.

## Results

Demographic characteristics		Patient (N=140)		Control (N=140)	
		N (%)	Mean ±SD	N (%)	Mean ±SD
Age	18-39 yrs.	33 (23.6)	45.81	38 (27.1)	42.01
	40-60 yrs.	107 (76.4)	±9.49	102 (72.9)	±9.29
Sex	Male	68 (48.57)		69 (49.28)	
	Female	72 (51.43)		71 (50.72)	
Residence	Urban	99 (70.7)		93 (66.4)	
	Rural	41 (29.3)		47 (33.6)	
BMI	Normal (18.5-23)	31 (22.1)	25.35	86 (61.9)	22.79
	Overweight (23-25)	36 (25.7)	±3.09	46 (33.1)	±1.25
	Obese (>25)	73 (52.1)		7 (5.0)	

The age range of our patient and control group was 18 to 60 years.

Mean age (±SD) of patients with DM= 45.81 (±9.49) years.

Mean age (±SD) of Healthy control= 42.01 (±9.29) years.

Most of our respondents were from urban areas in both patient and control groups. More than half of our patients with DM were obese (52.1%). (Table 1)

**Table 2: Comparison of patients and healthy control according to DSM-V score**

DSM-V	Patient		Control		t (p)
	N (%)	Mean ±SD	N (%)	Mean ±SD	
No depression	89 (63.6)	1.81	120(85.7)	0.62	4.644
Depression	51 (36.4)	±2.6	20 (14.3)	±1.56	(p<0.001)

Mean DSM-V score was significantly higher in patient group compared to control (t=4.644, df = 278, p<0.001). (Table 2)

**Table 3: Comparison of patient and healthy control according to "The Hamilton Rating Scale for Depression".**

Severity	Patient		Control		t (p)
	N (%)	Mean ±SD	N (%)	Mean ±SD	
Mild	13 (25.5)		11 (55.0)		
Moderate	23 (45.1)	23.08 ±7.40	7 (35.0)	16.60 ±5.66	3.53 (p<0.01)
Severe	15 (29.4)		2 (10.0)		

Significantly more severe depression was observed in patients than in control according to "The Hamilton Rating Scale for Depression". And mean score was significantly higher in patients than controls. (t=3.53, df = 69, p<0.01) (Table 3)

**Table 4(A): Distribution of patient according to DSM-V score.**

Characters		No depression N (%)	Depression N (%)	t/F (P)
Age	18-39 yrs.	27 (81.8)	6 (18.2)	
	40-60 yrs.	62 (57.9)	45 (42.1)	-3.947 (<0.001)
Sex	Male	49 (72.05)	19 (27.95)	-1.788
	Female	40 (55.56)	32 (44.44)	(> 0.05)
Marital status	Married	81 (73.0)	30 (27.0)	9.822
	Unmarried	7 (87.5)	1 (12.5)	(<0.001)
	Separated	1 (25.0)	3 (75.0)	
	Divorced	0 (0.0)	5 (100.0)	
	Widow	0 (0.0)	12 (100.0)	
BMI	Normal	24 (77.4)	7 (22.6)	7.354
	Overweight	30 (83.3)	6 (16.7)	(<0.01)
	Obese	35 (47.9)	38 (52.1)	

It was observed that, depression was more in patients aged 40-60 years 45 (42.1%) than in those aged 20-39 years 6 (18.2%), which was statistically significant (t = - 3.947, p< 0.001).

Significantly higher depression was observed in divorced and widow patient compared to married ( $p < 0.01$ , 95% CI = 0.58 to 6.66;  $p < 0.001$ , 95% CI = 1.60 to 5.64) and unmarried ( $p < 0.01$ , 95% CI = 0.71 to 8.29 ;  $p < 0.001$ , 95% CI = 1.47 to 7.53) according to DSM-V score respectively.

Significantly higher depression was observed in obese patient compared to patient with normal body weight ( $p < 0.01$ , 95% CI = 0.36 to 2.93) and overweight ( $p < 0.01$ , 95% CI = 0.36 to 2.82) according to DSM-V score. (Table 4(A))

**Table 4(B): Distribution of patient according to DSM-V**

Character		No depression N (%)	Depression N (%)	t/F (P)
Type of DM	Type-I	10 (83.3)	2 (16.7)	- 4.964
	Type-II	79 (61.7)	49 (38.3)	(<0.001)
Duration	< 5 yrs.	24 (63.2)	14 (36.8)	-0.891
	>5 yrs.	65 (63.7)	37 (36.3)	(> 0.05)
Treatment	Insulin	27 (61.4)	17 (38.7)	3.671
	OHA	21 (80.8)	5 (19.2)	(< 0.05)
	Insulin & OHA	41 (58.6)	29 (41.5)	
HbA1C	Good control	68 (90.67)	7 (9.33)	118.319
	Fair control	12 (31.58)	26 (68.42)	(<0.001)
	Poor control	9 (33.33)	18(66.67)	

Type 2 DM patients were found to have more depression than Type 1 DM, which was statistically significant ( $t = -4.964$ ,  $p < 0.001$ ).

Patients who were taking both insulin & OHA are significantly more depressed than those taking OHA or insulin alone ( $p < 0.05$ , 95% CI = 0.02 to 2.87).

Statistically significant depression were observed in poorly control DM (HbA1C > 8%) compared to fair control (HbA1c 7-8%) ( $p < 0.001$ , 95% CI = 2.29 to 3.82) and good control ( HbA1c <7%) ( $p < 0.001$ , 95% CI = 4.25 to 5.98)

Combined use of OHA & insulin was significantly associated with more severe depression ( $F = 5.549$ ,  $p < 0.01$ ) compared to either OHA or insulin alone. (Table 4(B))

**Table 5: Distribution of patients according to the severity of depression and level of control**

Characteristics		Mild depression N (%)	Moderate depression N (%)	Severe depression N (%)	t/F (P)
HbA1C	Good control	5 (71.43)	2 (28.57)	0 (0.0)	24.110
	Fair control	6 (27.27)	15 (68.18)	1 (4.55)	(<0.001)
	Poor control	7 (31.8)	1 (4.5)	14 (63.6)	

Patient with poorly controlled DM had significantly more severe depression as compared to those with good ( $p < 0.001$ , 95% CI = 4.26-5.98) & fairly ( $p < 0.001$ , 95% CI = 1.09- 3.03) controlled DM. (Table 5)

Significant positive correlation was observed between DSM-V score and age ( $r = 0.295$ ,  $p < 0.001$ ), BMI ( $r = 0.473$ ,  $p < 0.001$ ), duration of DM ( $r = 0.287$ ,  $p < 0.01$ ) and HbA1C ( $r = 0.734$ ,  $p < 0.001$ ) in patient with DM.

## Discussion

Our results have shown that the proportion of depression was significantly higher in patients with DM than in healthy control, which was almost three times that of healthy people. It supported the link between diabetes and depression. Most of the earlier studies supported the higher prevalence of depression among patients with DM<sup>5,10</sup> while Engum et al.<sup>11</sup> did not find significant association for hyperglycaemia in relation to depression in type 1 and type 2 diabetes.

In our study, the mean age of patients of DM and the healthy control group were 45.81 ( $\pm 9.49$ ) years and 42.01 ( $\pm 9.29$ ) years, respectively. Our study showed significant associations between depression in diabetes and age 40-60 years. Our study found that most patients in 40-60 years group suffered most from moderate to severe depression.

This study showed that depression is more among females than males. The prevalence of depression among diabetics has been studied in different surveys, and an association of female gender has been previously reported.<sup>5,12,13</sup> However, some studies did not find any relation between gender and depression in diabetics.<sup>14,15</sup>

In the present study, single persons (divorced & widows) showed higher depression than their married & unmarried counterparts, which was consistent with other studies.<sup>16,17</sup> Changes in living arrangements, losses in social support, and decrease quality of life may be the cause.

Among the respondents, obese patients were more depressed than overweight and normal body weight, which was supported by other studies,<sup>18</sup> while some other studies didn't find an association between depression & BMI.<sup>19,20</sup>

Some studies that were limited to type 2 DM have shown a positive relationship between type 2 DM

and depression.<sup>13,21</sup> In our study type 2 DM patients (38.3%) were more depressed than type 1 DM patients (16.7%), which were statistically significant.

A positive correlation was found between duration of DM and DSM-V score. But no significant difference in depression was found between patients with diabetes < 5 years duration & patients with diabetes >5 years duration, which was consistent with other studies.<sup>20,22</sup> However, some smaller studies have reported a significant association between duration of diabetes and depression.<sup>9,23</sup>

In our study, 100% of the respondents received pharmacological treatment in addition to diet and discipline. Treatment with OHA revealed the lowest depression (19.2%), and a higher rate was found when insulin (38.7%) and insulin plus OHA (41.5%) were used. Patients viewed oral treatment as the least and insulin as the most burdensome treatment<sup>9,24</sup> and insulin was associated with a higher frequency of depression.<sup>25,26</sup> Pain of injection might be the reason for higher prevalence of depression among insulin-treated patients.<sup>9</sup> Injection hazards plus regularity in taking insulin as well as constraints in life may be the cause of depression in our opinion.

In our study, we found a significant relationship between depression frequency and glycaemic control. In other words, diabetics with good blood glucose control were less likely to be depressed than patients with poor glycaemic control as assessed by HbA1c.<sup>15,27,28,29</sup>

A small number of studies did not find any relationship between severity of depression and HbA1C level<sup>11,30</sup> which is inconsistent with our study.

## Conclusion:

Depression is one of the most common co-morbid psychiatric disorders associated with diabetes

mellitus. We have systematically evaluated patients with DM to see the frequency and factors associated with depression in patients with DM. Considering the result of this study and observations done by other researchers, it can be concluded that depression is an important psychiatric complication of diabetes mellitus and is more frequent among obese, single, treated with insulin & OHA, and those with uncontrolled diabetes. This association needs to be further studied in depth. In a setting where recognition, screening, and treatment levels remain low, health care providers need to focus their efforts on diagnosing, referring, and effectively treating this important disease.

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